## GRAY WHALE (*Eschrichtius robustus*): Eastern North Pacific Stock

### STOCK DEFINITION AND GEOGRAPHIC RANGE

Gray whales formerly occurred in the North Atlantic Ocean (Fraser 1970, Mead and Mitchell 1984), but this species is currently found only in the North Pacific (Rice et al. 1984). The following information was considered in classifying stock structure of gray whales based on the phylogeographic approach ~~by~~of Dizon et al. (1992): 1) Distributional data: two isolated geographic distributions in the North Pacific Ocean; 2) Population response data: ~~there is an increase in~~ the eastern North Pacific population has increased, and no evident increase in the western North Pacific; 3) Phenotypic data: unknown; and 4) Genotypic data: unknown. Based on this limited information, two stocks have been recognized in the North Pacific: the Eastern North Pacific stock, which lives along the west coast of North America (Fig. ~~31~~35), and the Western North Pacific or "Korean" stock, which lives along the coast of eastern Asia (Rice 1981, Rice et al. 1984). Most of the Eastern North Pacific stock spends the summer feeding in the northern Bering and Chukchi Seas (Rice and Wolman 1971, Berzin 1984, Nerini 1984). However, gray whales have been reported feeding in the summer in waters off of Southeast Alaska, British Columbia, Washington, Oregon, and California (Rice and Wolman 1971, Darling 1984, Nerini 1984, Rice et al. 1984). Each fall, the whales migrate south along the coast of North America from Alaska to Baja California, in Mexico (Rice and Wolman 1971), most of them starting in November or December (Rugh et al. 2001). The Eastern North Pacific stock winters mainly along the west coast of Baja California, using certain shallow, nearly landlocked lagoons and bays, and calves are born from early January to mid-February (Rice et al. 1981). The northbound migration generally begins in mid-February and continues through May (Rice et al. 1981, 1984; Poole 1984a), with cows and newborn calves migrating northward primarily between March and June along the U.S. West Coast.

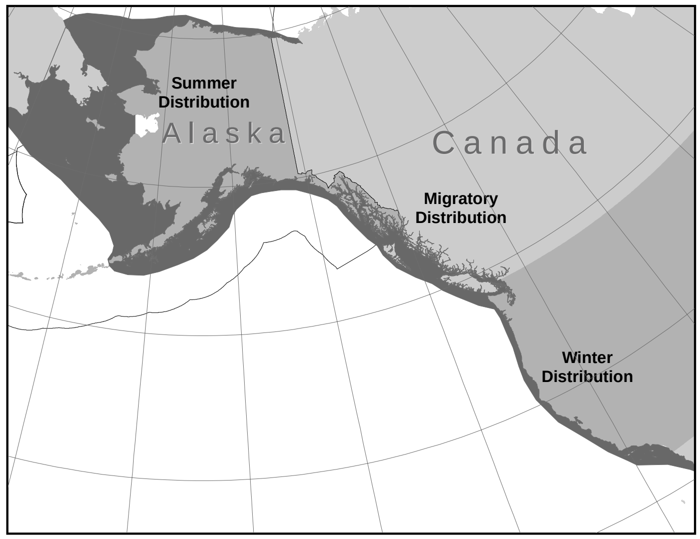


**Figure ~~31~~35.** Approximate distribution of the Eastern North Pacific stock of gray whales (shaded area). Excluding some Mexican waters, the entire range of this stock is depicted.

~~There has been some speculation that discrete stocks of gray whales occur in coastal areas, such as Puget Sound. Although some localized, seasonal site fidelity has been confirmed, animals in Puget Sound have also been seen using coastal areas from northern California to Southeast Alaska in spring and fall (Calambokidis and Quan 1999, Gosho et al. 1999). At this time, available information indicates that the Eastern North Pacific stock of gray whales should be managed as a single stock (Swartz et al. 2000).~~

While most North Pacific gray whales spend the summer in the shallow waters of the northern and western Bering Sea and Arctic Ocean, some animals feed along the Pacific coast. Photo-identification studies of these animals indicate that they move widely within and between areas on the Pacific coast, are not always observed in the same area each year, and may have several year gaps between resightings in studied areas (Calambokidis and Quan 1999, Quan 2000, Calambokidis et al. 2002). The so-called "Pacific coast feeding aggregation" defines one of the areas where feeding groups occur. While some animals in this group demonstrate some site-fidelity, available information from sighting records (Calambokis and Quan 1999, Quan 2000) and genetics (Ramakrishnan et al. 2001, Steeves 1998) indicates that this group is a component of the eastern North Pacific population, and is not an isolated population unit.

## POPULATION SIZE

Systematic counts of gray whales migrating south along the central California coast have been conducted by shore-based observers at Granite Canyon most years since 1967 (Fig. 36). ~~The latest abundance estimate (26,635; CV = 0.1006) is based on counts made during the 1997/98 southbound migration (Hobbs and Rugh 1999). This estimate is not significantly larger than the previous estimates of 22,263 (CV = 0.0925) whales in 1995/96 (Hobbs et al. in press); 23,109 (CV = 0.0542) whales in 1993/94 (Laake et al. 1994); and 21,296 (CV = 0.0605) whales in 1987/88 (Buckland et al. 1993); but it is significantly higher than the estimate of 17,674 (CV = 0.0587) whales in 1992/93 (Laake et al. 1994).~~ The most recent abundance estimates are based on counts made during the 1997/98, 2000/01 and 2001/02 southbound migrations. Analyses of these data resulted in abundance estimates of 29,758 for 1997/98, 19,448 for 2000/01, and 18,178 for 2001/02 (Rugh et al. In press). Recent estimates were: 22,263 CV = 9.25%) whales in 1995/96, 23,109 (CV = 5.42%) whales in 1993/94 (Laake et al. 1994) and 21,296 (CV = 6.05%) whales in 1987/88 (Buckland et al. 1993). Variations in estimates may be due in part to undocumented sampling variation or to differences in the proportion of the gray whale stock migrating as far as the central California coast each year (Hobbs and Rugh 1999). ~~The 1997/98 abundance estimate is the most recent and is considered a reliable estimate of abundance for this stock. The most recent survey to determine abundance was carried out during the winter of 2000/01. An abundance estimate based on these data will be available in the 2003 SARs.~~ The decline in the 2000/01 and 2001/02 abundance estimates may be an indication that the abundance was responding to environmental limitations as the population approaches the carrying capacity of its environment. Low encounter rates in 2000/01 and 2001/02 may have been due to an unusually high number of whales that did not migrate as far south as Granite Canyon or the abundance may have actually declined following high mortality rates observed in 1999 and 2000 (Gulland et al. 2005, Fig. 37). Visibly emaciated whales (LeBoeuf et al. 2000; Moore et al. 2001) suggest a decline in food resources, perhaps associated with unusually high sea temperatures in 1997 (Minobe 2002). Several factors since this mortality event suggest that the high mortality rate was a short-term, acute event and not a chronic situation or trend: 1) counts of stranded dead gray whales dropped to levels below those seen prior to this event, 2) in 2001 living whales no longer

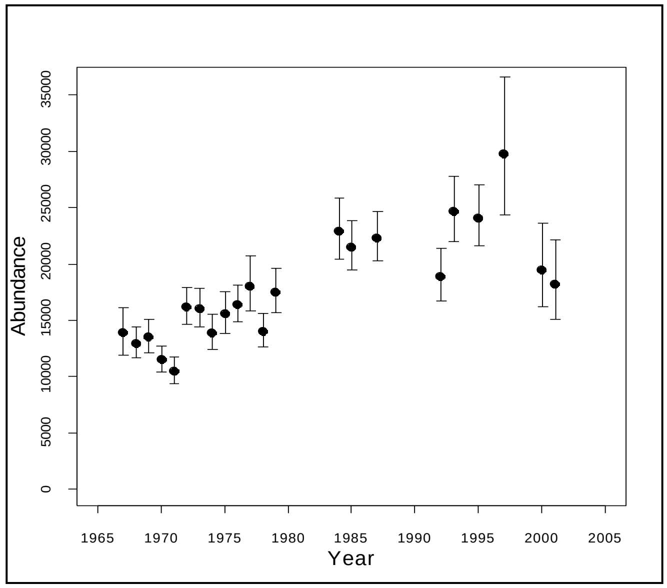


**Figure 36.** Estimated abundance of Eastern North Pacific gray whales from NMFS counts of migrating whales past Granite Canyon, California. Error bars indicate 95% log-normal CI (after Rugh et al. in press).

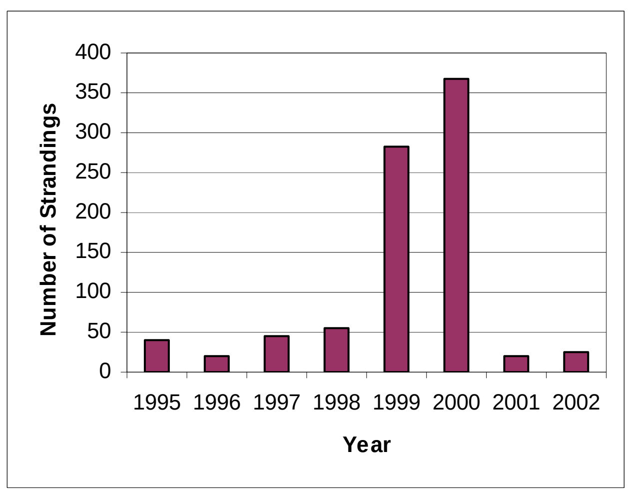


**Figure ~~32~~37.** Number of strandings of gray whales along the west coast of North America, 1995-2002. Low levels of strandings in 2001 and 2002 indicate that the stranding event of 1999-2000 was limited to those years.

appeared to be emaciated, and 3) calf counts in 2001/02, a year after the event ended, were similar to averages for previous years (W. Perryman, NMFS-SWFSC, pers. comm.; Rugh et al. in press).

Gray whale calves ~~have been~~were counted from Piedras Blancas, a shore site in central California, in 1980-81 (Poole 1984a) and each year since 1994 (Perryman et al. 2002, 2004). In 1980 and 1981, calves passing this site comprised 4.7% to 5.2% of the population~~, respectively~~ (Poole 1984b). From 1994-2000, calf production indices (calf estimate/total population estimate) were 4.2%, 2.7%, 4.8%, 5.8%, 5.5%, 1.7% and 1.1%, respectively (Perryman et al. 2002). Gray whale calves have also been counted from the shore station at Granite Canyon during the southbound migration (Shelden et al. 1995, Shelden and Rugh 2001). Th~~e~~ose results have indicated an apparent increase in the percentage of calf sightings from 0.0%-0.2% during 1952-74, 0.1%-0.9% during 1984-95 (Shelden et al. 1995), and 0.3%-1.5% during 1996-2001 (Shelden and Rugh 2001). This increase may be related to a trend toward later migrations over the observation period (Rugh et al. 2001, Buckland and Breiwick ~~in press~~ 2002), or it may be due to an increase in spatial and temporal distribution of calving as the population increased.

**Minimum Population Estimate**

The minimum population estimate ($N_{MIN}$) for this stock is calculated from Equation 1 from the PBR Guidelines (Wade and Angliss 1997): $N_{MIN} = N/\exp(0.842\times[\ln(1+[CV(N)]^2)]^{½})$. ~~Using the 1997/98 population estimate of 26,635 and its associated CV of 0.1006, $N_{MIN}$ for this stock is 24,477.~~ Using the mean of the 2000/01 and 2001/02 abundance estimates (not significantly different) of 18,813 and its associated CV of 0.069, $N_{MIN}$ for this stock is 17,752.

**Current Population Trend**

The population size of the Eastern North Pacific gray whale stock has been increasing over the past several decades. The estimated annual rate of increase, based on shore counts of southward migrating gray whales between 1967 and 1988, is 3.~~29~~3% with a standard error of 0.44% (Buckland et al. 1993). Taking account of the harvest, Wade and DeMaster (1996) estimated an underlying annual rate of increase of 4.4% (95% CI: 3.1%-5.6%) for this same time period. Incorporating the census data through the 1993/94 migration resulted in an annual rate of increase of 2.~~57~~6% (SE = 0.4%: IWC 1995~~a~~). ~~Most recently,~~ Breiwick (1999) estimated the annual rate of increase from 1967/68 to 1997/98 at 2.52% (95% CI: 2.04%-3.12%), and Wade and DeMaster (1996) estimated the annual rate of increase from 1967/68 to 1995/96 at 2.4% (95% CI: 1.6%-3.2%). Rugh et al. (In press) estimated the rate of increase from 1967/69 through 2001/02 at 1.9% (SE = 0.32%). They also fit a discrete logistic model to the abundance estimates resulting in an estimate of K (carrying capacity) of 26,290 (CV = 0.059).

In 1999 and 2000, a large number of gray whale strandings occurred along the west coast of North America between Baja California, Mexico, and the Bering Sea (Norman et al. 2000, Pérez-Cortés et al. 2000, Brownell et al. 2001, Gulland et al. 2005). A total of 273 gray whale strandings was reported in 1999 and 355 in 2000, compared to an average of 38 per year during the previous four years (Fig. ~~32~~36). Gray whale strandings occurred throughout the year in both 1999 and 2000, but regional peaks of strandings occurred where and when the whales were in their migration cycle. Hypothesized reasons for the increased stranding rate in recent years include starvation, effects of chemical contaminants, natural toxins, disease, direct anthropogenic factors (fishery interactions and ship strikes), increased survey/reporting effort, and effects of wind and currents on carcass deposition (Norman et al. 2000). Since only 16 animals showed conclusive evidence of direct human interaction in 1999-2000, it seems unreasonable that direct anthropogenic factors were responsible for the increase in strandings. In addition, although survey effort has varied considerably in Mexico and Alaska, it has been relatively constant in Washington, Oregon, and California. The other hypotheses indicated have not yet been conclusively eliminated. However, assuming a 5% mortality rate for gray whales (Wade and DeMaster 1996), it would be reasonable to expect that approximately 1,300 gray whales would die annually of natural causes. Thus, while the stranding rate was certainly much higher in 1999 and 2000 than in previous years, it may not indicate a higher mortality rate. Preliminary stranding data indicate that the stranding event in 1999 and 2000 is over, as only 21 gray whale strandings were reported in 2001 (T. Rowles, NMFS-FPR, pers. comm.). Reports from a portion of the stock's range indicate that only 5 and 6 strandings were reported in 2002 and 2003, respectively (C. Allen, pers. comm.).

**CURRENT AND MAXIMUM NET PRODUCTIVITY RATES**

Using abundance data through 1996, an analysis of the Eastern North Pacific gray whale population led to an estimate of $R_{max}$ of 0.072, with a 90% probability the value was between 0.039 and 0.126 (Wade 2002). This estimate came from the best fitting age- and sex-structured model, which was a density-dependent Leslie model including an additional variance term, with females and males modeled separately. This estimate was higher than the estimate of $R_{max}$ from a logistic model (0.053, 90% probability 0.031 to 0.113), which was not age- and sex-structured (Wade 2002). The Alaska Scientific Review Group recommended the use of the 0.053 point estimate for $R_{max}$. The difference in the two estimates of $R_{max}$ is due to the bias in the harvest towards females, which is not accounted for in the logistic model. Therefore, NMFS has decided to use the estimate from the age- and sex-structured model, which had a lower 10th percentile of 0.047. This has the interpretation that there is a 90% probability that the true value of $R_{max}$ is greater than 0.047. This is sufficient evidence that $R_{max}$ for Eastern North Pacific gray whales is greater than the default value of 0.04. Therefore, NMFS will use a $R_{max}$ of 0.047.

**POTENTIAL BIOLOGICAL REMOVAL**

Under the 1994 re-authorized Marine Mammal Protection Act (MMPA), the potential biological removal (PBR) is defined as the product of the minimum population estimate, one-half the maximum theoretical net productivity rate, and a recovery factor: PBR = $N_{MIN} \times 0.5R_{MAX} \times F_R$. The recovery factor ($F_R$) for this stock is 1.0, the upper limit of the range (0.5-1.0) of values for non-listed stocks which are increasing while undergoing removals due to subsistence hunters (Wade and Angliss 1997). Thus, for the Eastern North Pacific stock of gray whales, PBR = ~~575~~442 animals (~~24,477~~18,813 × 0.0235 × 1.0).

**ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY**

**Fisheries Information**

~~Six different commercial fisheries operating in Alaska waters within the range of the Eastern North Pacific gray whale stock were monitored for incidental take by NMFS observers during 1990-00: Bering Sea (and Aleutian Islands) groundfish trawl, longline, and pot fisheries and Gulf of Alaska groundfish trawl, longline, and pot fisheries. No gray whale mortalities were observed for any of these Alaska fisheries.~~

In previous stock assessments, there were six different observed federal commercial fisheries in Alaska that could have had incidental serious injuries or mortalities of gray whales. In 2004, the definitions of these commercial fisheries were changed to reflect target species: these new definitions have resulted in the identification of 22 observed fisheries in the Gulf of Alaska and Bering Sea that use trawl, longline, or pot gear (69 FR 70094, 2 December 2004). There were no observed serious injuries or mortalities of gray whales in any of those fisheries.

NMFS observers monitored the northern Washington marine set gillnet fishery (coastal + inland waters), otherwise known as the Makah tribal fishery for ~~c~~Chinook salmon, during 1990-98 and in 2000. There was no observer coverage in this fishery in 1999; however, the total fishing effort was only 4 net days (in inland waters), and no marine mammals were reported taken. One gray whale was observed taken in 1990 (Gearin et al. 1994) and one in 1995 (P. Gearin, unpubl. data). In July of 1996, one gray whale was entangled in the same tribal set gillnet fishery, but it was released unharmed (P. Gearin, AFSC-NMML, pers. comm.). Data from the most recent 5 years indicates that no gray whales were seriously injured or killed incidental to this fishery. ~~Data from 1990-00 are included in Table 25a, although the mean estimated annual mortality is calculated using only the most recent 5 years of available data.~~

NMFS observers ~~also~~ monitored the California/Oregon thresher shark/swordfish drift gillnet fishery from 1993 to 200~~0~~3 (Table ~~25a~~39; Julian 1997; Cameron 1998; Julian and Beeson 1998; Cameron and Forney 1999, 2000; Carretta 2001~~;~~, ~~Carretta~~ 2002; Carretta and Chivers 2003, 2004). One gray whale mortality was observed in this fishery in both 1998 and 1999. Overall entanglement rates in the California/Oregon thresher shark/swordfish drift gillnet fishery dropped considerably after the 1997 implementation of a Take Reduction Plan, which included skipper education workshops and required the use of pingers and minimum 6-fathom extenders on buoy lines (Barlow and Cameron 1999). Data from the most recent 5 years indicates that no gray whales were seriously injured or killed incidental to this fishery. ~~Because of the changes in this fishery after implementation of the Take Reduction Plan, mean annual takes in Table 25a are based only on 1997-2000 data.~~

~~The mean annual mortality was 0.2 (CV = 1.0) for the northern Washington marine set gillnet fishery and 2.5 (CV = 0.58) for the California/Oregon thresher shark/swordfish drift gillnet fishery, resulting in a mean annual mortality rate of 2.7 (CV = 0.54) gray whales per year from observed fisheries.~~

An additional source of information on the number of gray whales killed or injured incidental to commercial fishery operations is the logbook/self-reported fisheries information required of vessel operators by the MMPA. During the period between 1990 and 200~~0~~3, logbook/fisher self-reports indicated 2 gray whale mortalities related to the Bristol Bay gillnet fisheries in 1990 and one gray whale mortality resulting from WA/OR/CA crab pot gear, resulting in an annual mean of ~~0.5~~0.7 gray whale mortalities from interactions with commercial fishing gear. In 1990, logbook records from the Bristol Bay set and drift gillnet fisheries were combined. As it is not possible to determine which fishery was responsible for the gray whale mortalities reported in 1990, both fisheries have been included in Table ~~25a~~39. However, because logbook records are most likely negatively biased (Credle et al. 1994), these are considered to be minimum estimates. Logbook data are available for part of 1989-94, after which incidental mortality reporting requirements were modified. Under the new system, logbooks are no longer required; instead, fishers provide self-reports. Data for the 1994-95 phase-in period are fragmentary. After 1995, the level of reporting dropped dramatically, such that the records are considered incomplete and estimates of mortality based on them represent minimums (see Appendix 7 for details).

**Table ~~25a~~39.** Summary of incidental mortality of Eastern North Pacific gray whales due to commercial ~~and tribal~~ fisheries from 1990-200~~0~~3 and calculation of the mean annual mortality rate. Mean annual mortality in brackets represents a minimum estimate from logbook/self-reports or stranding data. Data from 1996-200~~0~~3 (or the most recent 5 years of available data) are used in the mortality calculation. n/a indicates that data are not available.

| Fishery name | Years | Data type | Range of observer coverage | Observed mortality (in given yrs.) | Estimated mortality (in given yrs.) | Mean annual mortality |
|---|---|---|---|---|---|---|
| ~~Northern Washington marine set gillnet (tribal: coastal + inland waters)~~ | ~~90-00~~ | ~~obs data~~ | ~~33-98%~~ | ~~1, 0, 0, 0, 0, 1, 0, 0, 0, n/a, 0~~ | ~~1, 0, 0, 0, 0, 1, 0, 0, 0, n/a, 0~~ | ~~0.2 (CV = 1.0)~~ |
| ~~CA/OR thresher shark/swordfish drift gillnet~~ | ~~93-00~~ | ~~obs data~~ | ~~12-25%~~ | ~~0, 0, 0, 0, 0, 1, 1, 0~~ | ~~0, 0, 0, 0, 0, 5, 5, 0~~ | ~~2.5* (CV = 0.58)~~ |
| ~~Observer program total~~ | | | | | | ~~2.7 (CV = 0.54)~~ |
| | | | | **~~Reported mortalities~~** | | |
| Bristol Bay salmon drift and set gillnet fisheries | 90-~~00~~03 | logbook /self-reports | n/a | 2, 0, 0, 0~~, n/a, n/a, n/a, n/a, n/a, n/a, n/a~~ 1994-03: n/a | n/a | [≥0.5] |
| WA/OR/CA crab pot | 90-03 | logbook /self-reports | n/a | 1990-02: n/a 2000: 1 | n/a | [≥0.2] |
| Unknown west coast fisheries | 93-~~00~~03 | strand data | n/a | 0, 5, 3, 3, 6, 4, ~~5, 8~~3, 3, n/a, 2, n/a | n/a | [≥~~5.2~~3.6] |
| AK salmon purse seine | 99-~~00~~03 | strand data | n/a | 1, n/a, n/a, n/a, n/a | n/a | [≥0.5] |
| Pot fisheries | 99-03 | strand data | n/a | 1, 2, n/a, n/a, 3 | n/a | [≥1.2] |
| CA yellowtail/barracuda/ white seabass gillnet fishery | 99-03 | strand data | n/a | n/a, 1, n/a, n/a, n/a | n/a | [≥0.2] |
| Other entanglements | 99-03 | Strand data | n/a | 1, 2, n/a, 2, 1 | n/a | [≥1.2] |
| Minimum total annual mortality | | | | | | ≥~~8.9~~7.4 |

* Only 1997-2000 mortality estimates are included in the average because of gear modifications implemented within the fishery as part of a 1997 Take Reduction Plan. Gear modifications included the use of net extenders and acoustic warning devices (pingers).

Reports of entangled gray whales found swimming, floating, or stranded with fishing gear attached occurs along the U.S. west coast and British Columbia. Details of strandings that occurred in 1993-95 and 1996-98 in the United States and British Columbia are described in Hill and DeMaster (1999) and Angliss et al. (2002), respectively; while Table ~~25b~~40 presents data on strandings that occurred on the U. S. west coast from 1999-0~~0~~3; these data are summarized in Table 39. The strandings resulting from commercial fishing are listed as unknown west coast fisheries in Table ~~25a~~39, unless they could be attributed to a particular fisheries. During the 5-year period from ~~1996-2000~~1999-2003, stranding network data indicate a minimum annual mean of ~~5.7~~7.4 gray whale mortalities resulting from interactions with commercial fishing gear.

**Table ~~25b~~40.** Human-related gray whale strandings and entanglements, 1999-~~2000~~2003. An asterisk in the "number" column indicates cases that were not considered serious injuries. Note: Due in part to concerns expressed by the Alaska Scientific Review Group, the guidelines for what should constitute a "serious injury" to a large cetacean are to be reviewed and revised, if necessary, by 2006. This review may result in changes to whether the animals identified in this table are considered "seriously injured".

| Year | Number | Area | Condition | Description |
|---|---|---|---|---|
| 1999 | 1 | Port Gravina, PWS, AK | Dead | Entangled in AK salmon purse seine net |
| 1999 | 1 | Bristol Bay, AK | Dead | Entangled |
| 1999 | 1* | Offshore North Coronado Is., CA | Non-fatal injury | Ship strike |
| 1999 | 1 | Wreck Creek, WA | Dead | Net wrapped around flukes |
| 1999 | 1 | Twin Harbors State Park, WA (Grayland) | Dead | Rope through mouth |
| 1999 | 1 | 1.5 mi. offshore Rancho Palos Verdes, CA | Injury; status unknown | Pink gillnet & attached float wrapped around flukes; swimming w/difficulty; unable to dive |
| 1999 | 1 | 10 mi. offshore Port Hueneme, CA | Dead | Wrapped in pot gear & associated floats |
| 1999 | 1* | 2 mi. offshore Crescent City, CA | Non-fatal injury | Crab pot line wrapped around flukes & mouth; disentangled by rescue team |
| 1999 | 1* | 3 mi. offshore Crescent City, CA | Released alive | Crab pot line wrapped around body; released from entangling gear |
| 1999 | 1 | Pt. Loma, CA | Dead | 18" harpoon tip embedded in left dorsum |
| 1999 | 1 | Muir Beach, CA | Dead | Ship strike |
| 2000 | 1 | Depoe Bay, OR | Alive | Trailing fish line with longline buoys attached |
| 2000 | 1 | Brookings, OR | Alive | Head entangled in line |
| 2000 | 1 | Offshore Pt. Loma, CA | Status unknown | Trailing lobster pot gear |
| 2000 | 1 | Offshore San Clemente, CA | Status unknown | Yellow polypropylene line wrapped around flukes of free swimming whale |
| 2000 | 1 | Redwood National Park, CA | Dead | Ship strike |
| 2000 | 1 | Offshore Pt. Dume, CA | Status unknown | Line & buoys wrapped around flukes of free swimming whale |
| 2000 | 1 | Vandenberg AFB, CA | Dead | Lobster trap & rope wrapped around flukes |
| 2000 | 1 | Seal Beach, CA | Dead | White sea-bass gillnet wrapped around flukes |
| 2000 | 1 | Offshore Shelter Cove, CA | Injury; status unknown | Free-swimming whale with harpoon in back |
| 2000 | 1 | Offshore Aptos, CA | Status unknown | Fishing gear & floats wrapped around right pectoral flipper of free-swimming whale |
| 2001 | 1 | 3 miles offshore Morro Bay | Live, likely mortality | Vessel collision with free-swimming abandoned calf; major injuries to caudal peduncle; flukes completely severed |

| | | | | |
|---|---|---|---|---|
| 2002 | 1* | Offshore Santa Barbara | Live, unknown | Free-swimming animal observed with yellow line wrapped around torso; no disentanglement initiated |
| 2002 | 1 | Offshore Pt. Vicente | Live; unknown | Free-swimming animal observed with yellow line wrapped around caudal peduncle; no disentanglement initiated |
| 2002 | 1 | Grays Harbor, WA | Dead | Yellow fishing gear (lines and net) wrapped around peduncle |
| 2003 | 1 | Offshore Morro Bay | Live, unknown | Free-swimming animal observed with crab pot gear trailing from right side of mouth (crab pot, 75 ft of yellow polypropylene line & 2 buoys); USCG vessel on site; no disentanglement initiated |
| 2003 | 1 | North Island Naval Air Station | Dead | 15 foot calf with 3 foot length of yellow polypropylene line lodged in baleen |
| 2003 | 1 | 2.5 miles off San Mateo Point | Live | Free-swimming animal observed with 150 ft of crab pot line and associated crab pot wrapped around head, torso & flukes; crew of commercial sportfishing vessel cut most of line and crab pot away; small amount of line remained wrapped around flukes (approximately 4 wraps); animal observed swimming strongly away after disentanglement |
| 2003 | 1 | Lands End Beach | Dead | 25 ft calf; probable vessel collision; 2 propeller-like slashes through bone and baleen on right side of rostrum; broken rostrum |
| 2003 | 1 | Tillamook, OR | Dead | Crab pot line and buoy wrapped around flukes and caudal peduncle |

It should be noted that no observers have been assigned to most Alaska gillnet fisheries, including those in Bristol Bay ~~which~~that are known to interact with this stock, making the estimated mortality from U.S. fisheries a minimum figure. Further, due to a lack of observer programs there are few data concerning the mortality of marine mammals incidental to Canadian commercial fisheries, which are analogous to U.S. fisheries that are known to interact with gray whales. Data regarding the level of gray whale mortality related to commercial fisheries in Canadian waters, though thought to be small, are not readily available or reliable which results in an underestimate of the annual mortality for this stock. However, the large stock size and observed rate of increase over the past 20 years makes it unlikely that unreported mortalities from those fisheries would be a significant source of mortality for the stock. The estimated minimum annual mortality rate incidental to commercial fisheries (~~8.9~~7.4 whales; based on ~~observer data (2.7) and~~ logbook/self-reports (0.~~5~~7) or stranding reports (~~5.7~~6.7) where observer data were not available) is not known to exceed 10% of the PBR (~~58~~44.2) and, therefore, can be considered to be insignificant and approaching zero mortality and serious injury rate.

**Subsistence/Native Harvest Information**

Subsistence hunters in Alaska and Russia have traditionally harvested whales from this stock. The only reported takes by subsistence hunters in Alaska during this decade occurred in 1995, with the take of two gray whales by Alaska~~n~~ ~~n~~Natives (IWC 1997). Russian subsistence hunters reported taking 43 whales from this stock in 1996 (IWC 1998a) and 79 in 1997 (IWC 1999). In 1997, the IWC approved a 5-year quota (1998-2002) of 620 gray whales, with an annual cap of 140, for Russian and U.S. (Makah Indian Tribe) aboriginals based on the aboriginal needs statements from each country (IWC 1998b). The U.S. and Russia have agreed that the quota will be shared with an average annual harvest of 120 whales by the Russian Chukotka people and 4 whales by the Makah Indian Tribe. Russian aboriginals harvested ~~123 (+2 struck and lost) gray whales in 1998 (IWC 2000),~~ 121 (+2 struck and lost) in 1999 (IWC 2001), ~~and~~ 113 (+2 struck and lost) in 2000 (Borodin 2001), 112 in 2001 (Borodin et al. 2002), 131 in 2002 (Borodin 2003), and 126 (+2 struck and lost) in 2003 (Borodin 2004), while the Makah Tribe harvested 1 whale in 1999 (IWC 2001). Based on this information, the annual subsistence take averaged ~~97~~122 whales during the 5-year period from ~~1996-00~~1999-2003. ~~This level of take is well below the 1968-93 average of 159 whales per year (IWC 1995), during which time the population size increased.~~

**Other Mortality**

The nearshore migration route used by gray whales makes ship strikes another potential source of mortality. Between ~~1996 and 2000~~1999-2003, the California stranding network reported ~~5~~4 serious injuries or mortalities of gray whales caused by ship strikes: 1 each in 1999, 2000, 2001, and 2003~~3 in 1998 and 1 per year in 1999 and 2000~~ (J. Cordaro, NMFS-SWR, pers. comm.). One ship strike mortality was reported in Alaska in 1997 (B. Fadely, AFSC-NMML, pers. comm.). Additional mortality from ship strikes probably goes unreported because the whales either do not strand or do not have obvious signs of trauma. Therefore, it is not possible to quantify the actual mortality of gray whales from this source, and the annual mortality rate of 1.2 gray whales per year due to collisions with vessels represents a minimum estimate from this source of mortality.

In 1999 and 2000, the California stranding network reported gray whale strandings due to harpoon injuries (Table ~~25b~~40). A Russian harpoon tip was found in a dead whale that stranded in 1999 (R. Brownell, NMFS-SWFSC, pers. comm.), and an injured whale with a harpoon in its back was sighted in 2000. Since, these whales were likely harpooned during the aboriginal hunt in Russian waters, they would have been counted as "struck and lost" whales in the harvest data.

**STATUS OF STOCK**

The Eastern North Pacific stock of gray whales has been increasing in recent years while being subjected to known harvests. Based on currently available data, the estimated annual level of human-caused mortality and serious injury (~~107~~130.4), which includes mortalities from commercial fisheries (~~9~~7.4), Russian harvest (~~97~~122), and ship strikes (1) does not exceed the PBR (~~575~~442). Therefore, the Eastern North Pacific stock of gray whales is not classified as a strategic stock. In 1994 this stock was removed from the List of Endangered and Threatened Wildlife (the List), as it was no longer considered endangered or threatened under the Endangered Species Act (ESA). As required by the ESA, NMFS monitored the status of this stock for 5 years following delisting. A workshop convened by NMFS on 16-17 March 1999 at the AFSC's National Marine Mammal Laboratory in Seattle, WA, ~~followed a~~ reviewed ~~of~~ the status of the stock~~,~~ based on research conducted during the 5-year period following delisting. Invited workshop participants determined that the stock was neither in danger of extinction, nor likely to become endangered within the foreseeable future, therefore there was no apparent reason to reverse the previous decision to remove this stock from the List (Rugh et al. 1999). This recommendation was subsequently adopted by NMFS.

On 28 March 2001, NMFS received a petition from D. J. Schubert, on behalf of Australians for Animals, The Fund for Animals and several other organizations, to list the Eastern North Pacific stock of gray whales as threatened or endangered under the ESA. On 21 May 2001, NMFS determined that the petition did not present substantial scientific or commercial information sufficient to warrant the listing of this stock (66 FR 32305).

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Revised ~~5/1/03~~2/6/05

**HUMPBACK WHALE (*Megaptera novaeangliae*):**
**Western North Pacific Stock**

## STOCK DEFINITION AND GEOGRAPHIC RANGE

The humpback whale is distributed worldwide in all ocean basins, though it is less common in Arctic waters. In winter, most humpback whales occur in the temperate and tropical waters of the North and South Hemispheres (from 10°-23° latitude). Humpback whales in the high latitudes of the North Pacific are seasonal migrants that feed on zooplankton and small schooling fishes ~~in the cool, coastal waters of the western United States, western Canada, and the Russian Far East~~ (NMFS 1991). The historic feeding range of humpback whales in the North Pacific encompassed coastal and inland waters around the Pacific Rim from Point Conception, California, north to the Gulf of Alaska and the Bering Sea, and west along the Aleutian Islands to the Kamchatka Peninsula and into the Sea of Okhotsk (Nemoto 1957, Tomlin 1967, Johnson and Wolman 1984). ~~These recent sightings clearly demonstrate that the Bering Sea remains an important feeding area. Humpback whales have been known to enter the Chukchi Sea (Johnson and Wolman 1984).~~ The humpback whale population in much of this range was considerably reduced as a result of intensive commercial exploitation during the 20th century.

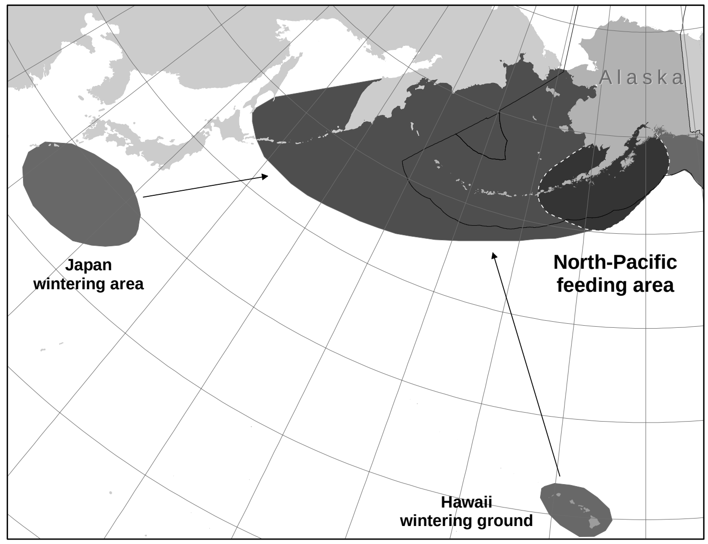


**Figure ~~33~~38.** Approximate distribution of humpback whales in the western North Pacific (shaded area). Feeding and wintering grounds are presented above (see text). Area within the dotted line is known to be an area of overlap with the Central North Pacific stock. See Figure 3~~4~~9 for humpback whale distribution in the eastern North Pacific.

Recent surveys in the central-eastern and southeastern Bering Sea in 1999 and 2000 resulted in new information about the distribution of humpback whales in these areas (Moore et al. 2002). The only sightings of humpback whales in the central-eastern Bering Sea was southwest of St. Lawrence Island; animals co-occurred with a group of killer whales and a large aggregation of Arctic cod. A few sightings occurred in the southeast Bering Sea, primarily outside Bristol Bay and north of the eastern Aleutian Islands (Moore et al. 2002). These recent sightings clearly demonstrate that the Bering Sea remains an important feeding area.

Aerial, vessel, and photo-identification surveys and genetic analyses indicate that within the U. S. Exclusive Economic Zone (EEZ) there are at least three ~~relatively separate~~ populations that migrate between their respective summer/fall feeding areas to winter/spring calving and mating areas (Calambokidis et al. 1997, Baker et al. 1998, Figs. ~~33~~38 and ~~34~~39): 1) winter/spring populations in coastal Central America and Mexico which migrate to the coast of California to southern British Columbia in summer/fall (Calambokidis et al. 1989, Steiger et al. 1991, Calambokidis et al. 1993) - referred to as the California/Oregon/Washington and Mexico stock; 2) winter/spring populations of the Hawaiian Islands which migrate to northern British Columbia/Southeast Alaska and Prince William Sound west to Unimak Pass~~Kodiak~~ (Baker et al. 1990, Perry et al. 1990, Calambokidis et al. 1997) - referred to as the Central North Pacific stock; and 3) winter/spring populations of Japan which, based on Discovery ~~Tag~~Mark information, probably migrate to waters west of ~~the Kodiak Archipelago~~Unimak Pass (the Bering Sea and Aleutian Islands) in summer/fall (Berzin and Rovnin 1966, Nishiwaki 1966, Darling 1991), and possibly to the Gulf of Anadyr (NMML unpublished data) - referred to as the Western North Pacific stock. Winter/spring populations of humpback whales also occur near Mexico's offshore islands in the Revillagigdeo Archipelago. The migratory destination of these whales is not well known (Calambokidis et al. 1993, Calambokidis et al. 1997). Some recent exchange between winter/spring areas has been documented (Darling and McSweeney 1985, Baker et al. 1986, Darling and Cerchio 1993), as well as movement between Japan and British Columbia, and Japan and the Kodiak Archipelago (Darling et al. 1996, Calambokidis et al. 1997). Calambokidis et al. (2001) concludes that there are at least 3 subpopulations of humpback whales on the wintering grounds (Hawaii, Japan, and Mexico), and possibly as many as 6 subpopulations, with subdivisions in Mexico, Japan, and central America.

Currently, there are insufficient data to apply the Dizon et al. (1992) phylogeographic approach to classify population structure in humpback whales. Until further information becomes available, three stocks of humpback whales (as described above) are recognized within the U.S. EEZ of the North Pacific: one in the Eastern North Pacific (the California/Oregon/Washington - Mexico stock), one in the Central North Pacific, and one in the Western North Pacific. The California/Oregon/Washington - Mexico humpback whale stock is reported separately in the Stock Assessment Reports for the Pacific Region.

Available information about feeding areas in U.S. waters for the western stock of humpback whales indicates that there is considerable overlap between the western North Pacific and central North Pacific stocks in the Gulf of Alaska between Kodiak Island and the Shumagin Islands. ~~Little is known about the feeding areas located in U.S. waters for the western North Pacific humpback whale stock. There has only been one study designed to photo-identify individual animals in the North Pacific waters west of the Kodiak Archipelago (Waite et al. 1999).~~ Over 3 years, Waite et al. (1999) ~~this study~~ collected photographs of 127 individuals located near Kodiak Island, 22 individuals located near the Shumagin Islands, 8 individuals located offshore to the southeast of the Shumagin Islands, and 7 individuals located near Akutan Island in the eastern Aleutian Islands. Only 7 of these individuals have been documented in Prince William Sound or Southeast Alaska. Witteveen (2003) conducted a photo-identification study in Marmot and Chiniak Bays (on the northeast side of Kodiak Island), documented 103 individual animals, and estimated that the number of humpback whales in that area totaled 157 (95% CI: 114, 241). ~~Waite et al. (1999) provide strong evidence that the waters around Kodiak support a discrete feeding aggregation, and it is unknown where these whales spend the winters.~~ Witteveen and Straley (2004) report matches between whales photographed at the Shumagin Is. between 1999-02 and whales photographed in Hawaii, offshore Mexico Islands, coastal Mexico waters, and Japan. ~~The lack of effort in the waters west of the Kodiak Archipelago is likely responsible for the fact that none of the whales identified off Japan have been resighted in the historical feeding areas of the stock (Bering Sea and Aleutian Islands).~~ In addition, ~~I~~individuals identified off Japan~~, however,~~ have been resighted in the eastern North Pacific (Darling et al. 1996, Calambokidis et al. 1997). ~~This may indicate that the western North Pacific humpback whale stock did not exclusively use the feeding areas in the western Pacific, or that a shift in the migratory destination of this stock has occurred. Thus, some unknown fraction of whales from the wintering grounds off Japan spend their summers feeding in areas typically utilized by whales from the central North Pacific stock.~~

In summary, new information from a variety of sources indicates that humpback whales from the western and Central North Pacific stocks mix on summer feeding grounds in the central Gulf of Alaska and perhaps the Bering Sea. A major research effort was initiated in 2002 in order to better delineate stock structure of humpback whales in the North Pacific using a variety of techniques, and it is expected that this effort will assist in resolving stock structure within a few years.

**POPULATION SIZE**

The abundance estimate of humpback whales in the North Pacific is based on data collected by nine independent research groups that conducted photo-identification studies of humpback whales in the three wintering areas (Mexico, Hawaii, and Japan). Photographs taken between 1991 and 1993 were used to estimate abundance because samples throughout the entire North Pacific were the largest and most complete during this period. Using Darroch's (1961) method, which utilizes only data from wintering areas (in this case data provided by two Japanese research groups), and averaging the 1991-92, 1992-93, and 1991-93 winter release-recovery information results in an abundance estimate of 394 (CV = 0.084) for the Western North Pacific humpback whale stock (Calambokidis et al. 1997).

A vessel survey conducted in August of 1994 covered 2,050 nautical miles of trackline south of the Aleutian Islands encountered humpback whales in scattered aggregations (57 sightings) throughout the study area (Forney and Brownell 1996). It is unknown whether the humpback whales encountered during this survey belonged to the Western or Central North Pacific stock.

A vessel survey for cetaceans was conducted in the central Bering Sea in July-August 1999 in cooperation with research on commercial fisheries (Moore et al. 2000). The survey included 6,043 nmi of tracklines, most of which were West of St. Matthew Island, north of the 200 m bathymetric contour, and south of the U.S./Russia Convention Line. Ten on-effort sightings of humpback whales occurred during this survey, the majority of which took place along the eastern Aleutian chain and near the U.S./Russian Convention Line just south of St. Lawrence Island. If these localized sightings are extrapolated to the entire survey area, an estimated abundance of 1,175 humpback whales (95% CI 197-7,009) occur in the central Bering Sea during the summer. However, Moore et al. (2002) determined that these sightings were too clumped in the central-eastern Bering Sea to be used to provide a reliable estimate for the area and decided to improve upon the method used to stratify the data in the analysis. Sightings of humpback whales also occurred during the survey conducted in the eastern Bering Sea in 2000; these sightings resulted in an estimated abundance of 102 (95% CI = 40-262). It is unknown whether these animals belong to the central or western North Pacific stock of humpback whales.

Photo-identification studies initiated to the west of Kodiak Island ~~in 1999~~from 1999-2002 have identified ~~approximately 350~~171 individual humpback whales, which resulted in a mark-recapture estimate of 410 (95% CI: 241-683). ~~and matches between these animals and animals documented in Hawaii, Japan and Mexico have occurred (B. Witteveen, unpublished report).~~ It is not known how many animals occurring to the west of Kodiak Island belong to the western or central North Pacific stock, but matches between animals photographed west of Kodiak Island and animals photographed in Hawaii, offshore Mexico, coastal Mexico, and Japan clearly indicate that overlap between stocks occurs in this area (Witteveen and Straley 2004, Witteveen et al. 2004).

There are no reliable estimates for the abundance of humpback whales at feeding areas for this stock because ~~the specific feeding areas are largely unknown~~surveys of the known feeding areas are incomplete, and because not all feeding areas are known.

### Minimum Population Estimate

The minimum population estimate ($N_{MIN}$) for this stock is calculated according to Equation 1 from the PBR Guidelines (Wade and Angliss 1997): $N_{MIN} = N/\exp(0.842\times[\ln(1+[CV(N)]^2)]^{½})$. Using the population estimate (N) of 394 and its associated CV(N) of 0.084, $N_{MIN}$ for this humpback whale stock is 367. Clearly, as the mark-recapture estimate to the west of Kodiak is 410 animals, and results of summer surveys in the Bering Sea indicate the presence of over 1000 animals, the calculated $N_{MIN}$ is conservative.

### Current Population Trend

Reliable information on trends in abundance for the western North Pacific humpback whale stock are currently not available.

## CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Utilizing a birth-interval model, Barlow and Clapham (1997) have estimated a population growth rate of 6.5% (SE = 1.2%) for the well-studied humpback whale population in the Gulf of Maine. ~~However, there are no estimates of the growth rate of humpback whale populations in the North Pacific (Best 1993).~~ Mobley et al. (2001) estimated a trend of 7% for 1993-00 using data from aerial surveys that were conducted in a consistent manner for several years across all of the Hawaiian Islands and were developed specifically to estimate a trend for the Central North Pacific stock. Although there is no estimate of the maximum net productivity rate for the Western stock, it is reasonable to assume that $R_{MAX}$ for this stock would be at least 7%. Hence, until additional data become available from ~~this or other~~ the western North Pacific humpback whale stock~~s~~, it is recommended that 7%~~ the cetacean maximum net productivity rate ($R_{MAX}$) of 4%~~ be employed as the maximum net productivity rate ($R_{MAX}$) for this stock (Wade and Angliss 1997).

## POTENTIAL BIOLOGICAL REMOVAL

Under the 1994 reauthorized Marine Mammal Protection Act (MMPA), the potential biological removal (PBR) is defined as the product of the minimum population estimate, one-half the maximum theoretical net productivity rate, and a recovery factor: PBR = $N_{MIN} \times 0.5R_{MAX} \times F_R$. The recovery factor ($F_R$) for this stock is 0.1, the value for cetacean stocks listed as endangered under the Endangered Species Act (Wade and Angliss 1997). Thus, for the Western North Pacific stock of humpback whale, PBR = ~~0.7~~1.3 animals (367 × ~~0.02~~0.035 × 0.1).

## ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

### Fisheries Information

~~Six different commercial fisheries operating in Alaska waters within the range of this stock were monitored for incidental take by fishery observers during 1990-2000~~2~~: Bering Sea/Aleutian Islands groundfish trawl, longline, and pot fisheries, and Gulf of Alaska groundfish trawl, longline, and pot fisheries. One humpback whale mortality was observed in the Bering Sea/Aleutian Islands groundfish trawl fishery during both 1998 and 1999.~~ Until 2004, there were six different federally-regulated commercial fisheries in Alaska that occurred within the range of the

Western North Pacific humpback whale stock that were monitored for incidental mortality by fishery observers. As of 2004, changes in fishery definitions in the List of Fisheries has resulted in separating these six fisheries into 22 fisheries (69 FR 70094, 2 December 2004). This change does not represent a change in fishing effort, but provides managers with better information on the component of each fishery that is responsible for the incidental serious injury or mortality of marine mammal stocks in Alaska. Between 1999-2003, there were incidental serious injuries and mortalities of Western North Pacific humpback whales in the following observed fisheries in Alaska (Table 41): Bering Sea/Aleutian Islands pollock trawl and Bering Sea/Aleutian Islands sablefish pot. Average annual mortality from observed fisheries was 0.~~6~~49 humpbacks from this stock (Table ~~26~~41). Note, however, that the stock identification is uncertain and the mortality may have been attributable to the central North Pacific stock of humpback whales. Thus, this mortality is assigned to both the central and western stocks.

An additional source of information on the number of humpback whales killed or injured incidental to commercial fishery operations is the self-reported fisheries information required of vessel operators by the MMPA. During the period between 1990 and 200~~1~~2, there were no fisher self-reports of humpback whale injuries or mortalities from interactions with commercial fishing gear in any Alaska fishery within the presumed range of the Western North Pacific humpback whale stock. Logbook data are available for part of 1989-94, after which incidental mortality reporting requirements were modified. Under the new system, logbooks are no longer required; instead, fishers provide self-reports. Data for the 1994-95 phase-in period is fragmentary. After 1995, the level of reporting dropped dramatically, such that the records are considered incomplete and estimates of mortality based on them represent minimums (see Appendix 7 for details).

Strandings of humpback whales entangled in fishing gear or with injuries caused by interactions with gear are another source of mortality data. The only fishery-related humpback stranding in an area thought to be occupied by animals from this stock was reported by a U. S. Coast Guard vessel in late June 1997 operating near the Bering Strait. The whale was found floating dead entangled in netting and trailing orange buoys (National Marine Mammal Laboratory, Platforms of Opportunity Program, unpubl. data, 7600 Sand Point Way NE, Seattle, WA 98115). With the given data it is not possible to determine which fishery (or even which country) caused the mortality. Note, that this mortality has been attributed the Western North Pacific stock, but without a tissue sample (for genetic analysis) or a photograph (for matching to known Japanese animals) it is not possible to be for certain (i.e., it may have belonged to the Central North Pacific stock). ~~Averaging this mortality over the 5-year period 1994-99 results in an estimated annual mortality of 0.2 humpback whales from this stock. This estimate is considered a minimum because not all entangled animals strand and not all stranded animals are found, or reported~~ No strandings or sightings of entangled humpback whales of this stock were reported between 1999 and 2003; however, effort in western Alaska is low.

**Table ~~26~~41.** Summary of incidental mortality of humpback whales (western North Pacific stock) due to commercial fisheries from 1990-200~~1~~3 and calculation of the mean annual mortality rate. Mean annual mortality in brackets represents a minimum estimate. For a particular fishery, the most recent 5 years of available data are used in the mortality calculation when more than 5 years of data are provided. *The humpback whale ~~mortality~~mortalities from 1998 and 2003 ~~was~~were seen by an observer but not during an "observed set"; thus quantification of effort cannot be accomplished and the single record cannot be extrapolated to provide a total estimated mortality level. n/a indicates that data are not available.

| Fishery name | Years | Data type | Range of observer coverage | Observed mortality (in given yrs.) | Estimated mortality (in given yrs.) | Mean annual mortality |
|---|---|---|---|---|---|---|
| ~~Bering Sea/Aleutian Is. (BSAI) groundfish trawl~~ | ~~97-01~~ | ~~obs data~~ | ~~62-77%~~ | ~~0~~<br>~~0~~<br>~~1~~<br>~~0~~<br>~~0~~ | ~~0~~<br>~~1*~~<br>~~1~~<br>~~0~~<br>~~0~~ | ~~0.6~~<br>~~(CV = 0.44)~~ |
| Bering Sea/Aleutian Islands pollock trawl | 1999<br>2000<br>2001<br>2002<br>2003 | obs data | 75.2<br>76.2<br>79.0<br>80.0<br>82.2 | 1<br>0<br>0<br>0<br>0 | 1<br>0<br>0<br>0<br>0 | 0.29<br>(CV = 0.55) |

| Fishery name | Years | Data type | Range of observer coverage | Observed mortality (in given yrs.) | Estimated mortality (in given yrs.) | Mean annual mortality |
|---|---|---|---|---|---|---|
| Bering Sea sablefish pot | 1999<br>2000<br>2001<br>2002<br>2003 | obs data | 44.1<br>62.6<br>38.7<br>40.6<br>21.4 | 0<br>0<br>0<br>0<br>0 | 0<br>0<br>0<br>1<br>0 | 0.20<br>(n/a) |
| Observer program total | | | | | | 0.~~6~~49 |
| | | | | **Reported mortalities** | | |
| Unknown fishery (Bering Sea) | 94-0~~1~~3 | strand data | n/a | 0, 0, 0<br>1<br>0<br>0<br>0<br>0<br>0 | ≥0.2 | [≥0.2] |
| Minimum total annual mortality | | | | | | [≥~~0.8~~0.69] |

The estimated annual mortality rate incidental to commercial fisheries is 0.~~8~~49 ~~(0.6 from observed fisheries plus 0.2 from the stranding data)~~ whales per year from this stock. However, this estimate is considered a minimum because there are no data concerning fishery-related mortalities in Japanese, Russian, or international waters. In addition, there is a small probability that fishery interactions discussed in the assessment for the Central North Pacific stock may have involved animals from this stock because the only known matches to feeding areas come from areas typically used by the Central North Pacific stock. Finally, much information on fishery interaction with the Central North Pacific stock is based on information reported to the Alaska Region as stranding data. However, very few stranding reports are received from areas west of Kodiak.

Brownell et al. (2000) compiled records of bycatch in Japanese and Korean commercial fisheries between 1993 and 2000. During the period 1995-99, there were six humpback whales indicated as “bycatch”. In addition, two strandings were reported during this period. Furthermore, analysis of four samples from meat found in markets indicated that humpback whales are being sold. At this time, it is not known whether any or all strandings were caused by incidental interactions with commercial fisheries; similarly, it is not known whether the humpback whales identified in market samples were killed as a result of incidental interactions with commercial fisheries. It is also not known which fishery may be responsible for the bycatch. Regardless, these data indicate a minimum mortality level of 1.1/year (using bycatch data only) to 2.4/year (using bycatch, stranding, and market data) in the waters of Japan and Korea.

**Subsistence/Native Harvest Information**

Subsistence hunters in Alaska and Russia have not been reported to take humpback whales from this stock.

## HISTORIC WHALING

The number of humpback whales in the North Pacific may have numbered approximately 15,000 individuals prior to exploitation (Rice 1978). Intensive commercial whaling removed more than 28,000 animals from the North Pacific during the 20th century (Rice 1978). ~~This mortality estimate likely underestimates the actual kill as a result of under-reporting of the Soviet catches (Yablokov 1994)~~. From 1961-1971, 6,793 humpback whales were killed illegally by the USSR. Most animals were taken from the Gulf of Alaska and Bering Sea (Doroshenko 2000).

## STATUS OF STOCK

The estimated human-related annual mortality rate (~~0.8~~0.69) ~~exceeds~~is less than the PBR level for this stock (~~0.7~~1.3). ~~At least one of the mortalities occurred in a U. S. fishery~~The estimated human-related mortality rate is based solely on mortalities that occurred incidental to commercial fisheries and is higher than the PBR level for this stock; therefore, the estimated fishery mortality and serious injury rate exceeds 10% of the PBR (~~0.07~~0.1). The rate cannot be considered insignificant and approaching zero. The humpback whale is listed as "endangered" under the Endangered Species Act, and therefore designated as "depleted" under the MMPA. ~~As a result, the Western North Pacific humpback whale stock is classified as a strategic stock.~~ Reliable population trend data and the status of this stock relative to its Optimum Sustainable Population size are currently unknown. Noise pollution from the U. S. Navy's Low Frequency Active ~~s~~Sonar program and other anthropogenic sources (i.e., shipping) is a potential concern as to the health of this stock.

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# HUMPBACK WHALE (*Megaptera novaeangliae*): Central North Pacific Stock

## STOCK DEFINITION AND GEOGRAPHIC RANGE

The humpback whale is distributed worldwide in all ocean basins, though it is less common in Arctic waters. In winter, most humpback whales occur in the temperate and tropical waters of the North and South Hemispheres (from 10°-23° latitude). Humpback whales in the high latitudes of the North Pacific are seasonal migrants that feed on zooplankton and small schooling fishes ~~in the cool, coastal waters of the western United States, western Canada, and the Russian Far East~~ (NMFS 1991). The historic feeding range of humpback whales in the North Pacific encompassed coastal and inland waters around the Pacific rim from Point Conception, California, north to the Gulf of Alaska and the Bering Sea, and west along the Aleutian Islands to the Kamchatka Peninsula and into the Sea of Okhotsk (Nemoto 1957, Tomlin 1967, Johnson and Wolman 1984). A ~~recent~~ vessel survey in the central Bering Sea in July of 1999 documented 17 humpback whale sightings, most of which were distributed along the eastern Aleutian Island chain and along the U.S.-Russia Convention Line south of St. Lawrence Island (Moore et al. 2000). ~~These recent sightings clearly demonstrate that the Bering Sea remains an important feeding area.~~ Humpback whales have been known to enter the Chukchi Sea (Johnson and Wolman 1984). The humpback whale population in much of this range was considerably reduced as a result of intensive commercial exploitation during the 20th century.

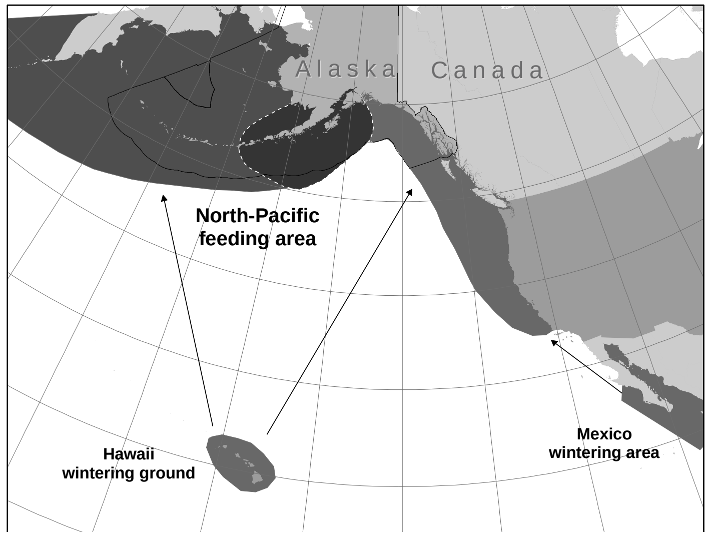


**Figure ~~34~~39.** Approximate distribution of humpback whales in the eastern North Pacific (shaded area). Feeding and wintering areas are presented above (see text). Area within the dotted line is known to be an area of overlap with Western North Pacific stock. See Figure 3~~3~~8 for distribution of humpback whales in the western North Pacific.

Aerial, vessel, and photo-identification surveys and genetic analyses indicate that within the U. S. Exclusive Economic Zone (EEZ) there are at least three relatively separate populations that migrate between their respective summer/fall feeding areas to winter/spring calving and mating areas (Calambokidis et al. 1997, Baker et al. 1998, Figs. ~~33~~38 and ~~32~~39): 1) winter/spring populations in coastal Central America and Mexico which migrate to the coast of California4 to southern British Columbia in summer/fall (Calambokidis et al. 1989, Steiger et al. 1991, Calambokidis et al. 1993) - referred to as the California/Oregon/Washington and Mexico stock; 2) winter/spring populations of the Hawaiian Islands which migrate to northern British Columbia/Southeast Alaska and Prince William Sound west to Unimak Pass~~Kodiak~~ (Baker et al. 1990, Perry et al. 1990, Calambokidis et al. 1997) - referred to as the Central North Pacific stock; and 3) winter/spring populations of Japan which, based on Discovery ~~Tag~~Mark information, probably migrate to waters west of the Kodiak Archipelago (the Bering Sea and Aleutian Islands) in summer/fall (Berzin and Rovnin 1966, Nishiwaki 1966, Darling 1991) - referred to as the Western North Pacific stock. Winter/spring populations of humpback whales also occur in Mexico's offshore islands. The migratory destination of th~~e~~ose whales is not well known (Calambokidis et al. 1993, Calambokidis et al. 1997), although some whales from the Revillagigdeo Archipelago have been matched to animals seen west of Kodiak, Alaska (Witteveen et al 2004). Some recent exchange between winter/spring areas has been documented (Darling and McSweeney 1985, Baker et al. 1986, Darling and Cerchio 1993), as well as movement between Japan and British Columbia, and Japan and the Kodiak Archipelago (Darling et al. 1996, Calambokidis et al. 1997). Calambokidis et al. (2001) concludes that there are at least 3 subpopulations of humpback whales on the wintering grounds (Hawaii, Japan, and Mexico), and possibly as many as 6 subpopulations, with subdivisions in Mexico, Japan, and central America.

Currently, there are insufficient data to apply the Dizon et al. (1992) phylogeographic approach to classify population structure in humpback whales. Until further information becomes available, 3 stocks of humpback whales ~~(as described above)~~ are recognized within the U. S. EEZ of the North Pacific: one in the Eastern North Pacific (the California/Oregon/Washington - Mexico stock), one in the Central North Pacific, and one in the Western North Pacific. The California/Oregon/Washington - Mexico humpback whale stock is reported separately in the Stock Assessment Reports for the Pacific Region.

The central North Pacific stock of humpback whales consists of feeding aggregations along the northern Pacific rim, and some humpbacks are present offshore in the Gulf of Alaska (Brueggeman et al.~~,~~ 1989). Humpback whales are also present in the Bering Sea (Moore et al. 2002); it is not conclusively known whether th~~e~~ose animals belong to the western or central North Pacific stocks. Three feeding areas for the Central North Pacific stock that have been studied using photo-identification techniques: ~~are~~ southeastern Alaska, Prince William Sound, and Kodiak Island. There has been some exchange of individual whales between these locations. For example, six whales have been sighted in both Prince William Sound and southeastern Alaska since studies began in 1977 (Perry et al. 1990~~,~~; von Ziegesar et al. 1994; S. Baker, D. McSweeney, J. Straley, O. von Ziegesar, unpubl. data~~,~~; Mizroch et al.~~, in review~~ 2004); nine whales have been sighted between Kodiak Island, including the area adjacent to Kodiak along the Kenai Peninsula, and Prince William Sound; and two whales have been sighted between Kodiak and southeastern Alaska (Waite et al. 1999). Calambokidis et al. (2001) reports interchange between Kodiak, Prince William Sound, and Southeast Alaska, although the number of individuals seen in multiple locations is small. ~~No interchange was reported between the Shumagin Islands and any other feeding area; however, given that the number of animals photographed in the vicinity of the Shumagin Islands was very small (15), this result may not be surprising.~~ Mizroch et al. (~~in review~~2004) examined photographs from 1979 to 1996 and reported that ~~under~~less than 1% of the individual whales photographed in either Southeast Alaska or Prince William Sound moved between areas. Based on sightings across all Alaska feeding areas, fewer than 2% of the individuals were seen in more than one areas (Mizroch et al. 2004). Fidelity to feeding areas is maternally directed; that is, whales return to the feeding areas where their mothers first brought them as calves (Martin et al. 1984, Baker et al. 1987).

As noted above, there is very little interchange documented between the Southeast Alaska feeding area and the Prince William Sound, Kodiak, and Shumagin Islands feeding areas to the north. Because of the documented lack of interchange, it is possible that a ~~severe~~ reduction in the population in the Southeast Alaska feeding area would not be augmented by animals ~~frequenting~~that normally use other feeding areas within a timeframe relevant to managers. Thus, NMFS is considering whether the Southeast Alaska feeding area, and possibly other feeding areas in the North Pacific, should be formally designated as separate stocks under the MMPA. In preparation for this decision, a PBR level and annual mortality rates will be calculated for the Southeast Alaska feeding area and included in the report for the entire central North Pacific humpback whale stock in order to guide managers in prioritizing conservation actions.

The Structure of Populations, Levels of Abundance, and Status of Humpbacks (SPLASH) Project began in 2004 as an international cooperative study to investigate north Pacific humpback whale population structure, status, trends, and potential human impacts. As part of the project the National Marine Fisheries Service sampled humpback summer feeding areas in inland waters of lower Southeast Alaska, the waters around the Aleutian Islands, and the Southeast Bering Sea in 2004. The same areas are scheduled for sampling in 2005 as well as offshore waters in the Gulf of Alaska. SPLASH is the first ever comprehensive field study of north Pacific humpback whales and should result in an increased level of biological understanding.

**POPULATION SIZE**

~~This stock of humpback whales winters in Hawaiian waters (Baker et al. 1986). Baker and Herman (1987) used capture-recapture methodology in Hawaii to estimate the population at 1,407 (95% CI 1,113-1,701), which they considered an estimate for the entire stock (NMFS 1991). However, the robustness of this estimate is questionable due to the opportunistic nature of the survey methodology in conjunction with a small sample size. Further, the data used to produce this estimate were collected between 1980 and 1983.~~

The current abundance estimate of humpback whales in the North Pacific is based on data collected by nine independent research groups that conducted photo-identification studies of humpback whales in the three wintering areas (Mexico, Hawaii, and Japan). Photographs taken between 1991 and 1993 were used to estimate abundance because samples throughout the entire North Pacific were the largest and most complete during this period. Using Darroch's (1961) method, which ~~utilizes~~uses only data from wintering areas, and averaging the 1991-92, 1992-93, and 1991-93 winter release-recovery information results in an abundance estimate of 4,005 (CV = 0.095) for the entire central North Pacific humpback whale stock (Calambokidis et al. 1997).~~ Add~~

Photo-identification methods were used to identify ~~149~~315 individual humpback whales ~~identified~~ in Prince William Sound from 1977 to ~~1993~~2001 (von Ziegesar 1992, Waite et al. 1999, von Ziegesar et al. 2004). ~~The abundance of the Prince William Sound feeding aggregation is thought to be less than 200 whales (Waite et al. 1999).~~ Waite et al. (1999) identified 127 individuals in the Kodiak area between 1991 and 1994, and calculated a total annual abundance estimate of 651 (95% CI: 356-1,523) for the Kodiak region. Witteveen et al (2004) conducted a mark-recapture study near the Shumagin Islands from 1999-2002 and estimated a total population size of 410 (95% CI: 241-683). ~~Photo-identification studies initiated to the west of Kodiak Island in 1999 have identified approximately 350 individual humpback whales, and matches between these animals and animals documented in Hawaii, Japan and Mexico have occurred (B. Witteveen, unpublished report).~~ It is not known how many animals occurring ~~to the west of Kodiak Island~~ in the Shumagin Islands belong to the western or central North Pacific stock.

This stock of humpback whales winters in Hawaiian waters (Baker et al. 1986). Baker and Herman (1987) used capture-recapture methods in Hawaii to estimate the population at 1,407 (95% CI 1,113-1,701), which they considered an estimate for the entire stock (NMFS 1991). However, the robustness of this estimate is questionable due to the opportunistic nature of the survey methods in conjunction with a small sample size. Further, the data used to produce this estimate were collected between 1980 and 1983. Mobley et al. (2001) conducted aerial surveys throughout the main Hawaiian Islands during 1993, 1995, 1998, and 2000. Abundance during these surveys was estimated as 2,754 (95% CI 2,044-3,468), 3,776 (95% CI: 2,925-4627), 4,358 (95% CI: 3,261-5,454), and 4,491 (95% CI 3,146-5,836). These estimates, which are based on line transect methods, are slightly more conservative than the estimates determined using mark-recapture techniques, perhaps due to computational problems associated with the assumption that there is a heterogeneous sighting probability across different regions of Hawaii.

In the Northern British Columbia region (primarily near Langara Island), 275 humpback whales were photo identified from 1992 to 1998 (G. Ellis, pers. comm., Pacific Biological Station, Nanaimo, BC, V9R 5K6). As of 2003, approximately 850-1,000 humpback whales have been identified in British Columbia (J. Ford, pers. comm.); it is not known how many of these animals match with animals identified in U.S. waters.

Different studies have used different approaches to estimate the abundance of animals in Southeast Alaska. Baker et al. (1992) estimated an abundance of 547 (95% CI: 504-590) using data collected from 1979 to 1986. Straley (1994) recalculated the estimate using a different analytical approach (Jolly-Seber open model for capture-recapture data) and obtained an mean population estimate of 393 animals (95% CI: 331-455) using the same 1979 to 1986 data set. Using data from 1986 to 1992 and the Jolly-Seber approach, Straley et al. (1995) estimated that the annual abundance of humpback whales in southeastern Alaska was 404 animals (95% CI:350-458). Straley et al. (2002) examined data for the northern portion of Southeast Alaska from 1994-2000 and provided an~~d~~ updated abundance estimate of 961 (95% CI: 657-1,076).

The sum of the available estimates for the known feeding areas is 2,036 (149 in PWS, 651 in Kodiak, 961 in Southeast, and 275 in British Columbia), which is well below the Calambokidis et al. (1997) estimate of 4,005 based on data collected from 1991 to 1993. However, the estimate for Southeast Alaska is known to be a minimum estimate because there is little to no photo-identification effort in the lower half of Southeast Alaska (south of Frederick Sound). In addition, many humpback whales feed seasonally near the Shumagin Islands, where photo-identification studies have only recently been initiated, and humpbacks are seen pelagically in the Gulf of Alaska. ~~Finally~~Also, Moore et al. (~~in press~~2002) ha~~s~~ve documented humpback whales in the Bering Sea, and it is not ~~conclusively~~ known whether these animals belong to the central or western North Pacific humpback whale stock.

**Minimum Population Estimate**

The minimum population estimate ($N_{MIN}$) for this stock is calculated according to Equation 1 from the PBR Guidelines (Wade and Angliss 1997): $N_{MIN} = N/\exp(0.842\times[\ln(1+[CV(N)]^2)]^{1/2})$. Using the population estimate (N) of 4,005 (estimated in 1993; Calambokidis et al. 1997) and its associated CV(N) of 0.095, $N_{MIN}$ for the entire central North Pacific humpback whale stock is 3,698. Although the Southeast Alaska feeding aggregation ~~cannot~~is not being formally considered a stock, the calculation of a PBR for this area may be useful for management purposes. Using the population estimate (N) of 961 and its associated CV(N) of 0.12, $N_{MIN}$ for this aggregation is 868.

**Current Population Trend**

Comparison of the estimate for the entire stock provided by Calambokidis et al. (1997) with the 1981 estimate of 1,407 (95% CI 1,113-1,701) from Baker and Herman (1987) suggests that the stock ~~has~~ increased in abundance between the early 1980s and early 1990s. However, the robustness of the Baker and Herman (1987) estimate is questionable due to the small sample size and opportunistic nature of the survey. ~~As a result, although~~

~~data support an increasing population size for this stock, it is not possible to assess the rate of increase.~~ Mizroch et al. (2004) calculate an annual population rate of increase of 10%. This is within the range of 8.8 to 14.4% reported by Best (1993) for humpback whales off South Africa, and is identical to the 10% value reported by Bannister and Hedley (2001) for humpback whales off western Australia. Mobley et al. (2001) estimated an annual increase of 7% for 1993-2000 using data from aerial surveys that were conducted in a consistent manner for several years across the main Hawaiian Islands and were developed specifically to estimate a trend for the Central stock.

The estimated number of animals in the Southeast Alaska portion of this stock has increased. The 2000 estimate of 961 (Straley et al. 2002) is substantially higher than estimates from the early and mid-1980s. A trend for the Southeast Alaska portion of this stock cannot be estimated from the data, however, because of differences in methods and areas covered.

**CURRENT AND MAXIMUM NET PRODUCTIVITY RATES**

~~Utilizing~~Using a birth-interval model, Barlow and Clapham (1997) have estimated a population growth rate of 6.5% (SE = 1.2%) for the well-studied humpback whale population in the Gulf of Maine. Mobley et al. (2001) conducted annual surveys of the humpback whale breeding grounds in Hawaii and estimated a rate of increase of 7% for the period 1993-2000. ~~Although there are no estimates of the growth rate of the entire humpback whale population in the North Pacific~~ Furthermore, it is clear that the abundance has increased in Southeast Alaska in recent years. ~~The available information indicates that the rate of increase between 1979 and 2000 is estimated at 0.088, which is a more accurate estimate of the maximum net productivity rate than the default estimate. Thus,~~ While 7% is the best available estimate of current rate of increase, and may or may not be the same as the stock's maximum net productivity rate, it seems reasonable to use a ~~0.088~~0.07 as a new, conservative estimate of the ~~current rate of increase as the~~ maximum net productivity rate.

**POTENTIAL BIOLOGICAL REMOVAL**

Under the 1994 reauthorized Marine Mammal Protection Act (MMPA), the potential biological removal (PBR) is defined as the product of the minimum population estimate, one-half the maximum theoretical net productivity rate, and a recovery factor: PBR = $N_{MIN} \times 0.5R_{MAX} \times F_R$. The recovery factor ($F_R$) for this stock is 0.1, the recommended value for cetacean stocks listed as endangered under the Endangered Species Act (Wade and Angliss 1997). The default value of 0.04 for the maximum net productivity rate will be replaced by 0.07, which is the best estimate of the current rate of increase and is considered a conservative estimate of the maximum net productivity rate. ~~An estimate of the maximum net productivity rate is not available for the entire stock, default value of 0.04 will be used for both the entire stock and the portion of the stock which occurs in Southeast Alaska.~~ Thus, for the entire Central North Pacific stock of humpback whale, PBR = ~~7.4~~12.9 animals (3,698 × ~~0.02~~0.035 × 0.1). The PBR level for the Southeast Alaska portion of this stock, PBR = ~~3.5~~3.0 animals (868 × ~~0.04~~0.035 × 0.1), and the PBR level for the northern portion of the stock is ~~3.9~~9.9 animals (~~7.4 – 3.5~~12.9 – 3.0).

**ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY**

**Fisheries Information**

Until 2004, there were four different federally-regulated commercial fisheries in Alaska that occurred within the range of the Central North Pacific humpback whale stock that were monitored for incidental mortality by fishery observers. As of 2004, changes in fishery definitions in the List of Fisheries has resulted in separating these four fisheries into 17 fisheries (69 FR 70094, 2 December 2004). This change does not represent a change in fishing effort, but provides managers with better information on the component of each fishery that is responsible for the incidental serious injury or mortality of marine mammal stocks in Alaska. Between 1999-2003, there were incidental serious injuries and mortalities of Central North Pacific humpback whales in the following observed fisheries in Alaska (Table 42): Bering Sea/Aleutian Islands pollock trawl and Bering Sea/Aleutian Islands sablefish pot.

Fishery observers also monitored the Hawaii swordfish, tuna, billfish, mahi mahi, wahoo, oceanic shark longline/setline fishery from 1990 to the present. Observer coverage for this fishery was very low (< 1%) prior to 1994 because the observer program was voluntary; the program became mandatory as of 1994 and the coverage has ranged from 4-5% since that time. Between 1999-2003, observers recorded one humpback whale entangled in this fishery in 2001; this entanglement was considered to be a serious injury and is ~~and~~ included in the mean annual fisheries mortality estimate (Table 41). The fate of this animal is unknown, though it is presumed to have died. The mortality rate was not estimated from the 1991 mortality due to the low level of observer coverage in that year

(<1%). Therefore, that single mortality also appears as the estimated mortality for 1991 and should be considered a minimum estimate.

~~Four different commercial fisheries operating in Alaska waters within the range of the Central North Pacific humpback whale stock were monitored for incidental take by fishery observers during 1990-01: Bering Sea/Aleutian Island groundfish trawl, Gulf of Alaska groundfish trawl, longline, and pot fisheries. One humpback whale mortality was observed in the Bering Sea/Aleutian Islands groundfish trawl fishery in 1998 and one in 1999. Average annual mortality from the observed fisheries in Alaska was 0.6 humpbacks from this stock (Table 27a~~42~~). Note, however, that the stock identification is uncertain and the mortality may have been attributable to the western stock of humpback whales. Thus, this mortality is assigned to both the central and western stocks. Fishery observers also monitored the Hawaii swordfish, tuna, billfish, mahi mahi, wahoo, oceanic shark longline/setline fishery during the same period. The range of observer coverage for this fishery, as well as the annual observed and estimated mortalities, are presented in Table 27a~~42~~. The observer program in the Hawaii fishery was voluntary from 1990 through 1993, leading to very low levels of observer coverage during those years (<1%). In 1994, the observer program became mandatory and observer coverage has been approximately 4-5% since that time. Fishery observers recorded one humpback whale entangled in longline gear in 1991. The fate of this animal is unknown, though it is presumed to have died. The mortality rate was not estimated from the 1991 mortality due to the low level of observer coverage in that year (<1%). Therefore, that single mortality also appears as the estimated mortality for 1991 and should be considered a minimum estimate. Note that another humpback whale was reported by fishers and whalewatch operators entangled in longline gear off Maui during 1993 (E. Nitta, pers. comm., National Marine Fisheries Service). This report was never confirmed and the fate of this animal is also unknown. The estimated mean annual mortality rate in all observed fisheries during the 5-year period from 1997 to 2001 is 0.4 humpback whales per year from this entire stock.~~

An additional source of information on the number of humpback whales killed or injured incidental to commercial fishery operations is the self-reported fisheries information required of vessel operators by the MMPA. During the 4-year period between 1990 and 1993, there were no fisher self-reports of humpback whale injuries or mortalities from interactions with commercial fishing gear in any Alaska fishery within the range of the Central North Pacific humpback whale stock. Logbook data are available for part of 1989-94, after which incidental mortality reporting requirements were modified. Under the new system, logbooks are no longer required; instead, fishers provide self-reports. Data for the 1994-95 phase-in period is fragmentary. After 1995, the level of reporting dropped dramatically, such that the records are considered incomplete and estimates of mortality based on them represent minimums (see Appendix 7 for details). In 1994, the incidental take of a humpback whale was reported in the Southeast Alaska salmon purse seine fishery. Another humpback whale is known to have been taken incidentally in this fishery in 1989, but due to its historic nature has not been included in Table ~~27a~~42. In 1996, a humpback whale was reported entangled and trailing gear as a result of interacting with the Southeast Alaska drift gillnet fishery. This whale is presumed to have died. Together, these two mortalities result in an annual mortality rate of 0.4 (0.2 + 0.2) humpback whales based on self-reported fisheries information (Table ~~27a~~42). This is considered to be a minimum estimate because logbook records (fisher self-reports required during 1990-94) are most likely negatively biased (Credle et al. 1994).

**Table ~~27a~~42.** Summary of incidental mortality of humpback whales (Central North Pacific stock) due to commercial fisheries from 1990 through ~~2001~~2003 and calculation of the mean annual mortality rate. Mean annual mortality in brackets represents a minimum estimate. For a particular fishery, the most recent 5 years of available data are used in the mortality calculation when more than 5 years of data are provided. n/a indicates that data are not available.

| Fishery name | Years | Data type | Range of observer coverage | Observed mortality (in given yrs.) | Estimated mortality (in given yrs.) | Mean annual mortality |
|---|---|---|---|---|---|---|
| Hawaii swordfish, tuna, billfish, mahi mahi, oceanic shark longline/setline | ~~90-00~~ | obs data | ~~<1-5%~~ | ~~0, 0, 0, 0, 0~~ | ~~0, 0, 0, 0, 0~~ | 0.8 |
| | 1999 | | 3.5 | 0 | 0 | |
| | 2000 | | 11.8 | 0 | 0 | |
| | 2001 | | 22.7 | 1 | 4 | |
| | 2002 | | 24.9 | 0 | 0 | |
| | 2003 | | | 0 | 0 | |

| **Fishery name** | **Years** | **Data type** | **Range of observer coverage** | **Observed mortality (in given yrs.)** | **Estimated mortality (in given yrs.)** | **Mean annual mortality** |
|---|---|---|---|---|---|---|
| ~~Bering Sea/Aleutian Is. (BSAI) groundfish trawl~~ | ~~97-01~~ | ~~obs data~~ | ~~62-77%~~ | ~~0~~<br>~~0~~<br>~~1~~<br>~~0~~<br>~~0~~ | ~~0~~<br>~~2~~<br>~~2~~<br>~~0~~<br>~~0~~ | ~~0.6~~<br>~~(CV = 0.44)~~ |
| Bering Sea/Aleutian Islands pollock trawl | 1999<br>2000<br>2001<br>2002<br>2003 | obs data | 75.2<br>76.2<br>79.0<br>80.0<br>82.2 | 1<br>0<br>0<br>0<br>0 | 1<br>0<br>0<br>0<br>0 | 0.29<br>(CV = 0.55) |
| Bering Sea sablefish pot | 1999<br>2000<br>2001<br>2002<br>2003 | obs data | 44.1<br>62.6<br>38.7<br>40.6<br>21.4 | 0<br>0<br>0<br>0<br>0 | 0<br>0<br>0<br>1<br>0 | 0.20<br>(n/a) |
| Observer program total | | | | | | ~~0.6~~1.3 |
| | | | | **Reported mortalities** | | |
| Southeast Alaska salmon drift gillnet | 90-0~~1~~3 | self reports | n/a | 0, 0, 0, 0<br>1994-03: n/a | n/a | [≥0.2] |
| Southeast Alaska salmon purse seine | 90-0~~1~~3 | ~~S~~self reports | n/a | 0, 0, 0, 0, 1<br>1995-03: n/a | n/a | [≥0.2] |
| Minimum total annual mortality from observer programs and self reports | | | | North: [0.8 + 0.29 + 0.2 = ~~0.6~~1.3]<br>SE: [0.8 + 0.2 + 0.2 ≥~~0.4~~1.2] | | |

Reports of entangled humpback whales found swimming, floating, or stranded with fishing gear attached occur in both Alaskan and Hawaiian waters. All reports of mortalities or injuries of humpback whales from the central North Pacific stock from ~~1997~~1999 to 2001 are provided in Table ~~27b~~43 and a summary of the information is provided in Table ~~27c~~44. Overall, there were ~~34~~30 reports of human-related mortalities or injuries during this 5-year period. Of these, there were ~~27~~21 incidents which involved commercial fishing gear, and ~~24~~13 of th~~e~~ose incidents involved serious injuries or mortalities. An additional seven incidents of human-related mortality or injury involved ship strikes and will be discussed in a forthcoming section. This estimate is considered a minimum because not all entangled animals strand and not all stranded animals are found, reported, or cause of death determined.

**Table ~~27b~~43.** Human-related strandings and entanglements of humpback whales (central North Pacific stock) from stranding reports, ~~1997-2001~~1998-2001. Areas are designated "SE" for Southeast Alaska or "North" for all other feeding areas; "Unk" indicates that the feeding area to which a whale belongs is unknown; it is assumed that the entanglement was reported in the area where the entanglement occurred, and that duplicate sightings have been removed. An asterisk in the "number" column indicates cases that were not considered serious injuries and thus were not included in the summarized information included in Table ~~27c~~44. This table includes summaries of the information on each incident; for detailed reports, contact the NMFS Alaska Region. The determination whether each injury should be considered serious, not serious, or not determinable (ND) was made by a subcommittee of the Alaska Scientific Review Group who reviewed the complete record for each incident. The guidelines for what should constitute a "serious injury" to a large cetacean are to be reviewed and revised, if necessary, by 2006. This review may result in changes to whether the animals identified in this table are considered "seriously injured" in future Stock Assessment Reports.

| Year | Number | Area | Condition | Brief description | Area | Severity of injury |
|---|---|---|---|---|---|---|
| ~~1997~~ | ~~1*~~ | ~~Island of Hawaii~~ | ~~Released alive~~ | ~~Alaska crab pot floats removed by U.S. Coast Guard~~ | ~~Unk~~ | |
| ~~1997~~ | ~~1~~ | ~~57 30 N 135 13 W NW Shelter Island~~ | ~~Alive~~ | ~~Collision with skiff~~ | ~~SE~~ | |
| ~~1997~~ | ~~1~~ | ~~Peril Straits, AK~~ | ~~Injured~~ | ~~Entangled in line; attempt to disentangle failed~~ | ~~SE~~ | |
| ~~1997~~ | ~~1~~ | ~~58 18 N 134 24 W NW Shelter Island~~ | ~~Injured~~ | ~~Tail wrapped in crab pot line~~ | ~~SE~~ | |
| ~~1997~~ | ~~1~~ | ~~58 21N 134 57 W NW Admiralty Island~~ | ~~Alive; entangled~~ | ~~Line and 2' diameter buoy attached~~ | ~~SE~~ | |
| ~~1998~~ | ~~1~~ | ~~Maalaea Bay, Lanai~~ | ~~Alive; entangled~~ | ~~Disentangled from gear, but some line still attached~~ | ~~Unk~~ | |
| 7/28/98 | ~~1*~~ | Petersburg | Alive, entangled, collision | Trailing possible king crab buoy & line; surfaced under boat; disentangled except for a loop of line around fluke | SE | Not serious |
| ~~1998~~ 7/18/98 | ~~1*~~ | Sitka, AK | Alive; entangled | ~~Commercial gillnet around flippers~~ Thick green net around head & flippers, not impeding progress | SE | Serious |
| 1998 | ~~1*~~ | Jakolof Bay | Alive | Disentangled from personal use pot gear (not included in AKR records) | North | Not serious |
| ~~1998~~ 7/31/98 | ~~1~~ | Ketchikan, AK | Injury; status unknown | Salmon purse seiner net (commercial) torn through, thought to have died | SE | Serious |
| ~~1998~~ 8/11/98 | ~~1*~~ | Juneau, AK | ~~Injured~~Alive, apparently uninjured | Ship strike ~~(8/11)~~; whale surfaced under an idle-ing catamaran; "glancing blow"; whale observed to blow and fluke with no apparent injury | SE | Not serious |
| ~~1998~~ | ~~1~~ | ~~Juneau, AK~~ | ~~Entangled~~ | ~~No details available (propose deleting - unconfirmed report)~~ | ~~SE~~ | |
| ~~1998~~ 8/23/98 | ~~1*~~ | Wrangell, AK | Alive | Commercial crab pot buoy removed | SE | Not serious |
| ~~1998~~ 9/17/98 | ~~1*~~ | Homer, AK | Alive | Subsistence/personal use tanner crab pot cut loose | North | Not determinable |
| ~~1998~~ 9/24/98 | ~~1*~~ | Juneau, AK | Injured | Ship strike ~~(9/24)~~; 24' vessel ran up dorsal surface of animal; animal observed for some time prior to incident and was behaving normally | SE | Not serious |
| ~~1998~~ 10/15/98 | ~~1*~~ | Sitka, AK | Alive | Commercial crab pot line cut free | SE | Serious |

| Year | Number | Area | Condition | Brief description | Area | Severity of injury |
|---|---|---|---|---|---|---|
| ~~1998~~ | ~~1~~ | ~~Ketchikan~~ | ~~Entangled~~ | ~~Swimming freely with pot gear attached (propose deleting - unconfirmed report)~~ | ~~SE~~ | |
| 1/6/99 | ~~1~~ | Hawaii, location not reported | Entangled | Line behind blowhole, connects to a single float | Unk | Serious |
| ~~1999~~ 9/9/99 | ~~1~~ | Homer | Entangled | In personal use crab pot gear; released (not in AKR records) | North | Not serious |
| 6/9/99 | ~~1*~~ | Sitka | Entangled | Line, buoy wrapped around whale; animal had no problems diving, breathing or swimming; NMFS vessel had difficulty keeping up | SE | Serious |
| 7/7/99 | ~~1~~ | Sitka | Alive | Ship strike; whale struck 73' wooden sailboat at anchor; made 5' hole in hull; baleen left in area | SE | Not serious |
| 7/28/99 | ~~1~~ | Juneau | Dead | Ship strike; whale found on bow of ship | SE | Dead |
| 9/6/99 | ~~1*~~ | Sisters Island | Alive | Ship strike; whale surfaced under sailboat, brought tail down on forward deck; no apparent injury to whale | SE | Not serious |
| ~~1999~~ 10/99 | ~~1*~~ | Prince of Wales Island | Entangled | In unknown pot gear, released completely by owner of pot gear, whale swam off | SE | Not serious |
| ~~1999~~ 11/99 | ~~1~~ | Metlakatla | Injury; status unknown | Ship strike; vessel was a recreational bayliner, skin left on bow of vessel | SE | Not determinable |
| ~~2000~~ 7/8/00 | ~~1*~~ | Lynn Canal | Entangled~~,~~ ~~released alive~~, status unknown AKR report does not indicate release | ~~Purse s~~Seine gear; completely entangling whale | SE | Serious |
| ~~2000~~ 12/4/00 | ~~1*~~ | Skagway | Entangled, released alive | Shrimp pot gear; released except for a single buoy | SE | Not serious |
| ~~2000~~ 10/16/00 | ~~1~~ | Uyak Bay | Entangled, released | Unknown line, gear; not clear whether animal was completely released from gear | North | Serious |
| 1/28/01 | ~~1~~ | Hawaii | Injured | Entangled in line/buoy from an AK fishery; released, injured - extent unknown | Unk | Not determinable |
| 6/19/01 | ~~1~~ | Dixon Entrance | Possibly injured | Probable s~~S~~hip strike; whale surfaced immediately in front of large vessel, vessel backed down and stopped, crew heard a "thump" just prior to backing down | SE | Not serious |
| 5/28/01 | ~~1~~ | Resurrection Bay | Entangled, released alive | Swimming freely with multiple lines and buoys attached (not in AKR records) | North | Not serious |
| 6/15/01 | ~~2~~ | Kodiak | Entangled | Attempt to disentangle failed; mother/calf pair (not in AKR records) | North | Serious |
| 7/12/01 | ~~1~~ | Yakutat | Found dead | Entangled in salmon set gillnet; may be same incident as one reported on 7/30/01 | North | Dead |

| Year | Number | Area | Condition | Brief description | Area | Severity of injury |
|---|---|---|---|---|---|---|
| 7/16/01 | ~~1~~ | Glacier Bay | Found dead, decomposed | Ship strike; fractured skull and pre-mortem hemorrhage | SE | Dead |
| ~~July~~ 7/30/01 | ~~1~~ | Bering Glacier | Found dead, decomposed | Entangled in gill net with floats~~fishing gear~~ | North | Dead |
| 8/13/01 | ~~1*~~ | Hoonah | Entangled, released alive | Shrimp pot gear; wounds on dorsal ridge and tail stock | SE | Not serious |
| 9/18/01 | ~~1~~ | Anchorage | Dead | Ship strike - container ship | North | Dead |
| 9/19/01 | ~~1*~~ | Lynn Canal | Entangled, release alive, status unknown | Shrimp pot gear | SE | Not determinable |
| ~~10/30/01~~ | ~~1*~~ | ~~Sitka~~ | ~~Entangled, release alive, status unknown~~ | ~~Longline gear (propose deleting - unconfirmed report)~~ | ~~SE~~ | |

**Table ~~27c:~~44.** Summary of central North Pacific humpback whale mortalities and serious injuries caused by entanglement and ship strikes from stranding reports, ~~1997-2001~~1998-2001. A summary of i~~I~~nformation used to determine whether an injury was serious or non-serious is included in Table ~~27b~~43~~; all animals not identified with an asterisk in Table 27b are considered serious injuries or mortalities~~.

| Area | Human activity/ Fishery | Mortalities | Serious injuries | Undeterminable | Average annual serious injury/mortality rate, 199~~7~~8-2001 |
|---|---|---|---|---|---|
| Northern | | | | | |
| | Ship strikes | ~~0~~<br>0<br>0<br>0<br>1 | ~~0~~<br>0<br>0<br>0<br>0 | <br>0<br>0<br>0<br>0 | ~~0.2~~0.25 |
| | Crab gear | ~~0~~<br>0<br>0<br>0<br>0 | ~~0~~<br>0<br>~~1~~<br>0<br>0 | <br>1<br>0<br>0<br>0 | ~~0.2~~0 |
| | Unspecified fishing gear/line | ~~0~~<br>0<br>0<br>0<br>~~1~~0 | ~~0~~<br>0<br>0<br>1<br>~~3~~2 | <br>0<br>0<br>0<br>0 | ~~1.~~0.75 |
| | Salmon set gillnet | ~~0~~<br>0<br>0<br>0<br>~~1~~1 | ~~0~~<br>0<br>0<br>0<br>0 | <br>0<br>0<br>0<br>0 | ~~0.2~~0.25 |
| | | | Total | | ~~1.4~~1.0/year fishery only<br>~~1.6~~1.25/year total |
| Southeast | | | | | |
| | Ship strikes | ~~0~~<br>0<br>~~0~~1<br>0<br>1 | ~~1~~<br>~~2~~0<br>~~1~~0<br>0<br>1 | <br>1<br>0<br>0<br>0 | ~~1.2~~0.50 |

| Area | Human activity/ Fishery | Mortalities | Serious injuries | Undeterminable | Average annual serious injury/mortality rate, 199~~7~~8-2001 |
|---|---|---|---|---|---|
| | Crab pot gear | ~~0~~<br>0<br>0<br>0<br>0 | ~~1~~<br>~~0~~1<br>0<br>0<br>0 | <br>0<br>0<br>0<br>0 | 0.~~2~~25 |
| | Unspecified fishing gear/line | ~~0~~<br>0<br>0<br>0<br>0 | ~~2,~~<br>~~2~~0<br>~~1~~1<br>0<br>0 | <br>0<br>0<br>0<br>0 | ~~1.2~~0.25 |
| | Unspecified gillnet | ~~0~~<br>0<br>0<br>0<br>0 | ~~0~~<br>1<br>0<br>0<br>0 | <br>0<br>0<br>0<br>0 | 0.25 |
| | Salmon purse seine | ~~0~~<br>0<br>0<br>0<br>0 | ~~0~~<br>1<br>0<br>~~0~~1<br>0 | <br>0<br>0<br>0<br>0 | 0.~~2~~50 |
| | | | Total | | 1.~~8~~25/year fishery only<br>~~3.0~~1.75/year total |
| Hawaii - summer feeding area unknown | | | | | |
| | Unspecified fishing gear | ~~0~~<br>0<br>0<br>0<br>0 | ~~0~~<br>1<br>0<br>0<br>~~1~~0 | <br>1<br>0<br>0<br>0 | ~~0.4~~0.25/year |
| | | | Total | | 0.25/year fishery only<br>0.25/year total |

The estimated overall minimum mortality and serious injury rate incidental to commercial fisheries for the northern portion of the stock is ~~2.0~~2.6 humpback whales per year, based on observer data from Alaska (~~0.60~~0.50), ~~and~~ stranding records from Alaska (~~1.4~~1.0), and observer and stranding data from Hawaii (~~1.6~~0.8 + 0.25) (Tables ~~27b~~43 and ~~27c~~44). The estimated minimum mortality and serious injury rate incidental to the commercial fisheries in Southeast Alaska is ~~2.2~~2.7 humpback whales per year, based on self reports ~~observer data~~ from Alaska (0.4), ~~and~~ stranding records from Alaska (1.25), and observer and stranding data from Hawaii (~~1.8~~ 0.8 + 0.25) (Tables ~~27b~~43 and ~~27c~~44). As mentioned previously, these estimates should be considered a minimum. No observers have been assigned to several fisheries that are known to interact with this stock, making the estimated mortality rate unreliable. Further, due to limited Canadian observer program data, mortality incidental to Canadian commercial fisheries (i.e., those similar to U.S. fisheries known to interact with humpback whales) is uncertain. Though interactions are thought to be minimal, ~~the lack of~~ data regarding the level of humpback whale mortality related to commercial fisheries in northern British Columbia are not available, again ~~reinforcing the point~~indicating that the estimated mortality incidental to commercial fisheries is underestimated for this stock.

**Subsistence/Native Harvest Information**

Subsistence hunters in Alaska have not been reported to take from this stock of humpback whales.

**Other Mortality**

Ship strikes and other interactions with vessels unrelated to fisheries have also occurred to humpback whales. The~~e~~ose cases are included in Table ~~27b~~43 and summarized in Table ~~27c~~44. Of those, ~~seven~~three ship strikes constitute "other sources" of mortality or serious injury; ~~six~~two of these ship strikes occurred in Southeast Alaska~~,~~ and one occurred in the northern portion of this stock's range. It is not known whether the difference in ship strike rates between Southeast Alaska and the northern portion of this stock is due to differences in reporting, amount of vessel traffic, densities of animals, or other factors. Averaged over the ~~5~~4 year period from ~~1997 to 2001~~1998-2001, these account for an additional ~~1.4~~0.75 humpback whale mortalities per year for the entire stock (0.25 ship strikes/year for the northern portion of the stock, and 0.50 strikes/year for the southeast portion).

**HISTORIC WHALING**

The number of humpback whales in the North Pacific may have numbered approximately 15,000 individuals prior to exploitation (Rice 1978). Intensive commercial whaling removed more than 28,000 animals from the North Pacific during the 20th century and may have reduced this population to as few as 1,000 before it was placed under international protection after the 1965 hunting season (Rice 1978). This mortality estimate likely underestimates the actual kill as a result of under-reporting of ~~the~~ Soviet catches (Yablokov 1994).

**STATUS OF STOCK**

As the estimated annual mortality and serious injury rate for the entire stock (5.0; ~~3.6~~4.2 of which was fishery-related) is considered a minimum, it is unclear whether the level of human-caused mortality and serious injury exceeds the PBR level (~~7.4~~12.9) for the entire stock. ~~However, t~~The estimated annual mortality and serious injury rate in Southeast Alaska (~~3.0~~3.2, of which ~~1.8~~2.7 was fishery-related) is ~~less than~~ greater than the PBR level if calculated only for the Southeast Alaska portion of the population (~~3.8~~3.0). The minimum estimated fishery mortality and serious injury for this stock is not less that 10% of the calculated PBR for either the entire stock or the portion of the stock in Southeast Alaska and, therefore, can not be considered to be insignificant and approaching a zero mortality and serious injury rate. The humpback whale is listed as "endangered" under the Endangered Species Act, and therefore designated as "depleted" under the MMPA. As a result, the Central North Pacific stock of humpback whale is classified as a strategic stock. ~~At least some portions of the stock have increased in abundance between the early 1980s and 2000, and the fact that the current rate of increase in Southeast Alaska may have recently declined may indicate that the Southeast Alaska portion of the stock is approaching its carrying capacity.~~ However, the status of the entire stock relative to its Optimum Sustainable Population size is unknown.

**Table 45.** Summary of serious injury and mortality levels for the central North Pacific stock of humpback whales.

| | Data type for fisheries information | | | | | | |
|---|---|---|---|---|---|---|---|
| Area | Observer | Self reports | Stranding | Ship strikes | Total | Total + HI | "PBR" |
| Northern | 0.5 | | 1.0 | 0.25 | 1.75 | 2.8 | 9.9 |
| Southeast | | 0.4 | 1.25 | .50 | 2.15 | 3.2 | 3.0 |
| Hawaii | 0.8 | | 0.25 | | 1.05 (added above) | | |
| TOTAL | 1.3 | 0.4 | 2.5 | 0.75 | 4.95 | | 12.9 |

**Habitat Concerns**

This stock is the focus of a large whalewatching industry in its wintering grounds (Hawaii) and a growing whalewatching industry in its summering grounds (Alaska). Regulations concerning minimum distance to keep from whales and how to operate vessels when in the vicinity of whales have been developed for Hawaii waters in an attempt to minimize the impact of whalewatching. In 2001, NMFS issued regulations to prohibit most approaches to humpback whales in Alaska within 100 yards (91.4m; ~~(~~66 FR 29502; May 31, 2001~~)~~). The growth of the whalewatching industry, however, is a concern as preferred habitats may be abandoned if disturbance levels are too high.

Noise from the Acoustic Thermometry of Ocean Climate (ATOC) program, the U.S. Navy's Low Frequency Active (LFA) sonar program, and other anthropogenic sources (i.e., shipping and whalewatching) in Hawaii waters is another concern for this stock. Results from experiments in 1996 off Hawaii indicated only subtle responses of humpback whales to ATOC-like transmissions (Frankel and Clark 1998). Frankel and Clark (2002) indicated that there were also slight shifts in humpback whale distribution in response to ATOC. Efforts are underway to evaluate the relative contribution of noise (e.g., experiments with LFA sound sources) to Hawaii's marine environment, although reports summarizing the results of recent research are not available.

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**FIN WHALE (*Balaenoptera physalis*): Northeast Pacific Stock**

## STOCK DEFINITION AND GEOGRAPHIC RANGE

Within the U.S. waters in the Pacific, fin whales are found seasonally off the coast of North America and Hawaii, and in the Bering Sea during the summer (Fig. ~~35~~40). Recent information on seasonal fin whale distribution has been gleaned from the reception of fin whale calls by bottom-mounted, offshore hydrophone arrays along the U.S. Pacific coast, in the central North Pacific, and in the western Aleutian Islands (Moore et~~.~~ al. 1998~~;~~, Watkins et al. 2000). Moore et al. (1998) and Watkins et al. (2000) both documented high levels of fin whale call rates along the U.S. Pacific coast beginning in August/September and lasting through February, suggesting that this may be an important feeding area during the winter. While peaks in call rates occurred during fall and winter in the central North Pacific and the Aleutian Islands, there were also a few calls recorded during the summer months. While seasonal differences in recorded call rates are generally consistent with the results of aerial surveys which have documented seasonal whale distribution, it is not known whether these differences in call rates reflect true seasonal differences in whale distribution, differences in calling rates, or differences in oceanographic properties (Moore et al. 1998). Fin whale calls have also been well-documented off of Hawaii during the winter (McDonald and Fox 1999), although aerial and shipboard surveys have found relatively few animals in Hawaiian waters (Mobley et al. 1996).

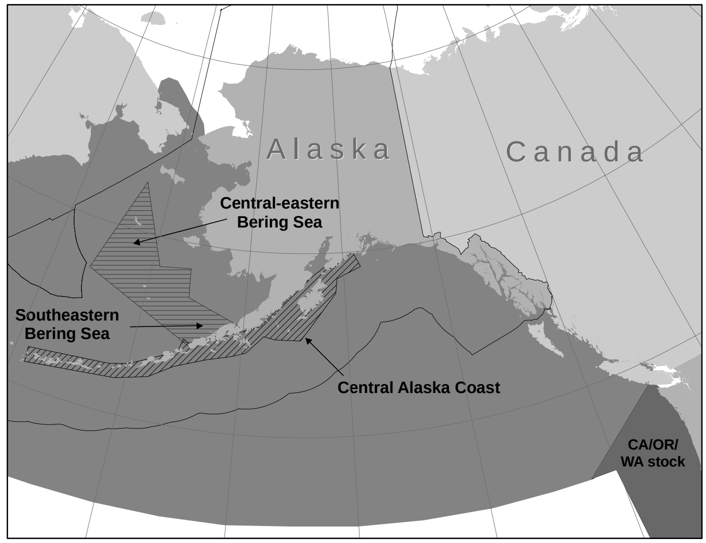


**Figure ~~35~~40.** Approximate distribution of fin whales in the eastern North Pacific (shaded area). Enclosed area indicates general location of the ~~1999 and 2000~~ pollock surveys ~~in the Bering Sea~~ from which regional estimates of the fin whale population was made.

Recent surveys in the central-eastern and southeastern Bering Sea in 1999 and 2000 resulted in new information about the distribution and relative abundance of fin whales in these areas (Moore et al. 2000~~;~~, 2002). Fin whale abundance estimates were nearly five times higher in the central-eastern Bering Sea than in the southeastern Bering Sea (Moore et al. 2002), and most sightings in the central-eastern Bering Sea occurred in a zone of particularly high productivity along the shelf break (Moore et al. 2000).

The following information was considered in classifying stock structure based on the Dizon et al. (1992) phylogeographic approach: 1) Distributional data: geographic distribution continuous in winter, possibly isolated in summer; 2) Population response data: unknown; 3) Phenotypic data: unknown; and 4) Genotypic data: unknown. Based on this limited information, the International Whaling Commission considers fin whales in the North Pacific to all belong to the same stock (Mizroch et al. 1984), although the authors cited additional evidence that supports the establishment of subpopulations in the North Pacific. Further, Fujino (1960) describes an eastern and a western group, which are isolated though may intermingle around the Aleutian Islands. Tag recoveries reported by Rice (1974) indicate that animals wintering off the coast of southern California range from central California to the Gulf of Alaska during the summer months. Fin whales along the Pacific coast of North America have been reported during the summer months from the Bering Sea to as far south as central Baja California (Leatherwood et al. 1982). As a result, stock structure of fin whales is considered equivocal. ~~Based on a conservative management approach, t~~

Three stocks of fin whales are currently recognized: 1) Alaska (Northeast Pacific), 2) California/Washington/Oregon, and 3) Hawaii. The California/Oregon/Washington and Hawaii fin whale stocks are reported separately in the Stock Assessment Reports for the Pacific Region.

## POPULATION SIZE

Reliable estimates of current and historical abundance for the entire Northeast Pacific fin whale stock are currently not available. Ranges of population estimates for the entire North Pacific prior to exploitation and in the early 1970s are 42,000 to 45,000 and 14,620 to 18,630, respectively (Ohsumi and Wada 1974), representing 32% to 44% of the precommercial whaling population size (Braham 1984). These estimates were based on population modeling, which incorporated catch and observation data. These estimates also include whales from the California/Oregon/Washington stock for which a separate abundance estimate is currently available.

Two recent studies provide some information on presence of fin whales, although they do not provide estimates of population size. A survey conducted in August of 1994 covering 2,050 nautical miles of trackline south of the Aleutian Islands encountered only 4 fin whale groups (Forney and Brownell 1996). However, this survey did not include all of the waters off Alaska where fin whale sightings have been reported, thus, no population estimate can be made. Passive acoustics were used off the island of Oahu, Hawaii, to document a minimum density estimate of 0.081 fin whales/1000km$^2$ from peak call rates during the winter (McDonald and Fox 1999). This density estimate is well below the population density of 1.1 animals/1,000 km$^2$ documented off the coast of California (Barlow~~,~~ 1995~~;~~, Forney et al. 1995)~~,~~ but does indicate that Hawaii is used seasonally by fin whales.

A visual survey for cetaceans was conducted in the central-eastern Bering Sea in July-August 1999 and in the southeastern Bering Sea in June-July 2000 in cooperation with research on commercial fisheries (Moore et al. 2002 ). The survey included 1,761 km and 2,194 km of effort in 1999 and 2000, respectively. Aggregations of fin whales were often sighted in 1999 in areas where the ship's echosounder identified large aggregations of zooplankton, euphausids, or fish (Moore et al. 2000). One aggregation of fin whales which occurred during an off-effort period involved greater than 100 animals and occurred in an area of dense fish echosign. Results of the surveys in 1999 and 2000 in the central-eastern Bering Sea and southeastern Bering Sea provided provisional estimates of 3,368 (CV = 0.29) and 683 (CV = 0.32), respectively (Moore et al. 2002). These estimates are considered provisional because they have not been corrected for animals missed on the trackline, animals submerged when the ship passed, and responsive movement. However, the provisional estimate for fin whales in each area is expected to be robust as previous studies have shown that only small correction factors are needed for this species. The Moore et al. (2002) estimate for 1999 is different than that of Moore et al. (2000) because it covers the south-eastern Bering Sea as well as the central-eastern Bering Sea. Additionally, the region covered by Moore et al. (2000) did not have consistent effort and thus could be inaccurate. This estimate cannot be used as an estimate of the entire Northeast Pacific stock of fin whales because it is based on a survey in only part of the stock's range.

Dedicated sighting cruises were conducted in coastal waters of western Alaska and the eastern and central Aleutian Islands in July-August 2001-2003 (Zerbini et al. in prep.). Over 9053 km of tracklines were surveyed in coastal waters (as far as 85 km offshore) between the Kenai Peninsula (150$^o$W) and Amchitka Pass (178$^o$W). Fin whale sightings (n=276) were observed from east of Kodiak Island to Samalga Pass, with high aggregations recorded near the Semidi Islands. Zerbini et al. (in prep.) estimated that 1652 (95% CI = 1142-2389) whales occurred in the area.

### Minimum Population Estimate

~~At this time, it is not possible to produce a reliable estimate of minimum abundance for this stock, as a current estimate of abundance is not available.~~

Since 1999, information on abundance of fin whales in Alaskan waters has improved considerably. Although the full range of fin whales in Alaskan waters has not been surveyed, a rough estimate of the size of the population west of the Kenai Peninsula could include the sums of the estimates from Moore et al. (2002) and Zerbini et al. (in prep.). Using this approach, an initial estimate of the fin whale population west of the Kenai Peninsula would be 5,703. This is clearly a minimum estimate, as no estimate is available for U.S. waters to the east of the Kenai Peninsula.

### Current Population Trend

Reliable information on trends in abundance for the Northeast Pacific stock of fin whales are currently not available. There is no indication whether recovery of this stock has or is taking place (Braham 1992~~;~~, Perry et al. 1999).

## CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

A reliable estimate of the maximum net productivity rate is currently unavailable for the Northeast Pacific fin whale stock. Hence, until additional data become available, it is recommended that the cetacean maximum net productivity rate ($R_{MAX}$) of 4% be employed for this stock (Wade and Angliss 1997).

## POTENTIAL BIOLOGICAL REMOVAL

Under the 1994 reauthorized Marine Mammal Protection Act (MMPA), the potential biological removal (PBR) is defined as the product of the minimum population estimate, one-half the maximum theoretical net productivity rate, and a recovery factor: PBR = $N_{MIN} \times 0.5R_{MAX} \times F_R$. The recovery factor ($F_R$) for this stock is 0.1, the recommended value for cetacean stocks which are listed as endangered (Wade and Angliss 1997). ~~However, because a reliable estimate of minimum abundance is currently not available, the PBR for this stock is unknown.~~ Thus, the PBR level for this stock is 11.4 (5,703 x 0.02 x 0.1).

## ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

### Fisheries Information

Prior to 1999, there were no observed or reported mortalities of fin whales incidental to commercial fishing operations within the range of this stock. However, in 1999, one fin whale was killed incidental to the ~~Bering Sea/Aleutian Island groundfish~~ Gulf of Alaska pollock trawl fishery (Table ~~28~~46). This single mortality results in an estimate of 3 mortalities in 1999, and an average 0.6 ~~(CV = 0.8)~~ (95% CI = 0.20 - 1.55) mortalities over the 5-year period from ~~1997 to 2001~~1999 to 2003. Although there have been a few strandings of fin whales recorded in recent years (2 and 1 in 1998 and 1999, respectively; NMFS unpublished data), none of these have been noted as having evidence of fishery interactions.

**Table ~~28~~46.** Summary of incidental mortality of fin whales (Northeast Pacific stock) due to commercial fisheries from 1997 to 2001 and calculation of the mean annual mortality rate.

| Fishery name | Years | Data type | Range of observer coverage | Observed mortality (in given yrs.) | Estimated mortality (in given yrs.) | Mean annual mortality |
|---|---|---|---|---|---|---|
| ~~Bering Sea/Aleutian Is. (BSAI) groundfish trawl~~ | ~~97-01~~ | ~~obs data~~ | ~~27-32%~~ | ~~0, 0, 1, 0, 0~~ | ~~0, 0, 3, 0, 0~~ | ~~0.6 (CV = 0.8xxx)~~ |
| Gulf of Alaska pollock trawl | 1999<br>2000<br>2001<br>2002<br>2003 | obs data | 31.7<br>27.5<br>17.6<br>26.0<br>31.4 | 1<br>0<br>0<br>0<br>0 | 3<br>0<br>0<br>0<br>0 | 0.59 (CV = 0.82) |
| Estimated total annual mortality | | | | | | ~~0.6~~0.59 ~~(CV = 0.8)~~ (CV = 0.82) |

The total estimated mortality and serious injury incurred by this stock as a result of interactions with commercial fisheries is 0.6 (CV = 0.8).

### Subsistence/Native Harvest Information

Subsistence hunters in Alaska and Russia have not been reported to take fin whales from this stock.

### Other Mortality

Between 194~~6~~25 and 1975, 4~~6,032~~7,645 fin whales were reported killed throughout the North Pacific (International Whaling Commission BIWS catch data, February 2003 version, unpublished), although newly revealed information about illegal Soviet catches indicates that the Soviets over-reported catches of about 1,200 fin whales, presumably to hide catches of other protected species (Doroshenko 2000). In 2000, a fin whale was struck by a vessel in Uyak Bay. Assuming this was the only ship strike which occurred during the 5-year period from 1997 to 2001, the average number of ship strikes per year is 0.2. There are no other reports of direct human-related injuries or mortalities to fin whales in Alaska waters included in the AKR stranding database for 1998-2003. Thus, the total estimated mortality and serious injury incurred by this stock is 0.8.

**STATUS OF STOCK**

The fin whale is listed as "endangered" under the Endangered Species Act of 1973, and therefore designated as "depleted" under the MMPA. As a result, the Northeast Pacific stock is classified as a strategic stock. Reliable estimates of the minimum population size, population trends, PBR, and status of the stock relative to its Optimum Sustainable Population size are currently not available. ~~The estimated annual rate of human-caused mortality and serious injury seems minimal for this stock; however, because of the estimated annual take of 0.6 animals, the minimum estimated mortality and serious injury cannot be considered to be insignificant and approaching a zero mortality and serious injury rate.~~ The estimated annual rate of mortality and serious injury incidental to commercial fisheries for this stock (0.6) does not exceed the PBR level for the stock (11.4). Thus, fishery-related mortality levels can be determined to have met a zero mortality and serious injury rate. There are no known habitat issues that are of particular concern for this stock.

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Revised 10/14/02

## MINKE WHALE (*Balaenoptera acutorostrata*): Alaska Stock

### STOCK DEFINITION AND GEOGRAPHIC RANGE~~:~~

In the North Pacific, minke whales occur from the Bering and Chukchi Seas south to near the Equator (Leatherwood et al. 1982). The following information was considered in classifying stock structure according to the Dizon et al. (1992) phylogeographic approach: 1) Distributional data: geographic distribution continuous, 2) Population response data: unknown; 3) Phenotypic data: unknown; and 4) Genotypic data: unknown. Based on this limited information, the International Whaling Commission (IWC) recognizes three stocks of minke whales in the North Pacific: one in the Sea of Japan/East China Sea, one in the rest of the western Pacific west of 180°N, and one in the "remainder" of the Pacific (Donovan 1991). The "remainder" stock designation reflects the lack of exploitation in the eastern Pacific and does not indicate that only one population exists in this area (Donovan 1991). In the "remainder" area, minke whales are relatively common in the Bering and Chukchi Seas and in the inshore waters of the Gulf of Alaska (Mizroch 1992), but are not considered abundant in any other part of the eastern Pacific (Leatherwood et al. 1982, Brueggeman et al. 1990). Minke whales are known to penetrate loose ice during the summer, and some individuals venture north of the Bering Strait (Leatherwood et al. 1982).

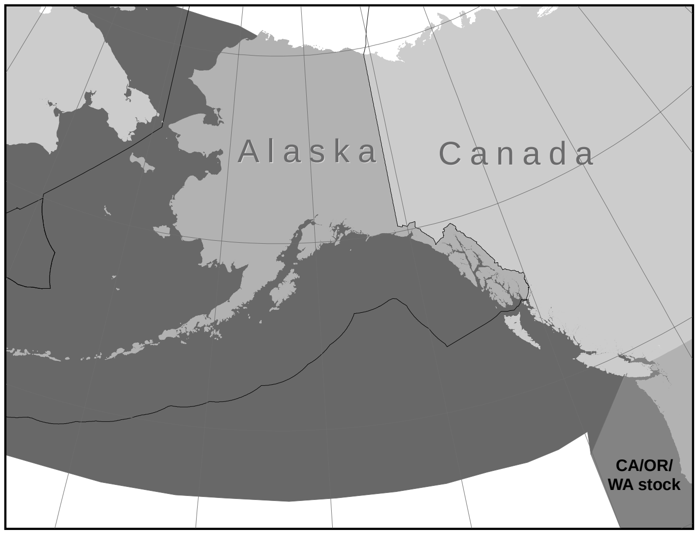


**Figure ~~36~~41.** Approximate distribution of minke whales in the eastern North Pacific (shaded area).

Recent surveys in the central-eastern and southeastern Bering Sea in 1999 and 2000 resulted in new information about the distribution and relative abundance of minke whales in these areas (Moore et al. 2000; Moore et al. 2002; see Fig. ~~35~~40 for location of survey areas). Minke whale abundance estimates were similar in the central-eastern Bering Sea and the southeastern Bering Sea (Moore et al. in press). Minke whales occurred throughout the area surveyed, but most sightings of minke whales in the central-eastern Bering Sea occurred along the upper slope in waters 100-200 m deep (Moore et al. 2000); sightings in the southeastern Bering Sea occurred along the north side of the Alaska Peninsula and were associated with the 100 m contour near the Pribilof Islands (Moore et al. 2002).

In the northern part of their range minke whales are believed to be migratory, whereas they appear to establish home ranges in the inland waters of Washington and along central California (Dorsey et al. 1990). Because the "resident" minke whales from California to Washington appear behaviorally distinct from migratory whales farther north, minke whales in Alaska are considered a separate stock from minke whales in California, Oregon, and Washington. Accordingly, two stocks of minke whales are recognized in U. S. waters: 1) Alaska, and 2) California/Washington/Oregon (Fig. ~~36~~41). The California/ Oregon/Washington minke whale stock is reported separately in the Stock Assessment Reports for the Pacific Region.

### POPULATION SIZE

No estimates have been made for the number of minke whales in the entire North Pacific. However, some information is now available on the numbers of minke whales in the Bering Sea. A visual survey for cetaceans was conducted in the central-eastern Bering Sea in July-August 1999, and in the southeastern Bering Sea in 2000, in cooperation with research on commercial fisheries (Moore et al.~~,~~ 2000; Moore et al. 2002; see Fig. ~~35~~40 for locations of survey areas). The survey included 1,761 km and 2,194 km of effort in 1999 and 2000, respectively. Results of the surveys in 1999 and 2000 provide provisional abundance estimates of 810 (CV = 0.36) and 1,003 (CV = 0.26) minke whales in the central-eastern and southeastern Bering Sea, respectively (Moore et al. in press). These estimates are considered provisional because they have not been corrected for animals missed on the trackline, animals submerged when the ship passed, or responsive movement. These estimates cannot be used as an estimate of the entire Alaska stock of minke whales because only a portion of the stock's range was surveyed.

### Minimum Population

At this time, it is not possible to produce a reliable estimate of minimum abundance for this stock, as current estimates of abundance are not available.

### Current Population Trend

There are no data on trends in minke whale abundance in Alaska waters.

## CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

There are no estimates of the growth rate of minke whale populations in the North Pacific (Best 1993). Hence, until additional data become available, it is recommended that the cetacean maximum net productivity rate ($R_{MAX}$) of 4% be employed for this stock (Wade and Angliss 1997).

## POTENTIAL BIOLOGICAL REMOVAL

Under the 1994 reauthorized Marine Mammal Protection Act (MMPA), the potential biological removal (PBR) is defined as the product of the minimum population estimate, one-half the maximum theoretical net productivity rate, and a recovery factor: PBR = $N_{min} \times 0.5R_{Max} \times F_R$. Given the status of this stock is unknown, the appropriate recovery factor is 0.5 (Wade and Angliss 1997). However, because an estimate of minimum abundance is not available, it is not possible to estimate a PBR for the Alaska minke whale stock at this time.

## ANNUAL HUMAN-CAUSED MORTALITY

### Fishery Information

Six different commercial fisheries operating in Alaska waters within the range of the Alaska minke whale stock were monitored for incidental take by NMFS observers during 1990-99: Bering Sea (and Aleutian Islands) groundfish trawl, longline, and pot fisheries, and Gulf of Alaska groundfish trawl, longline, and pot fisheries. No minke whale mortalities were observed for any of these fisheries. In 1989, one minke whale mortality (extrapolated to 2 mortalities) was observed in the Bering Sea/Gulf of Alaska joint-venture groundfish trawl fishery, the predecessor to the current Alaska groundfish trawl fishery.

**Table ~~29~~47.** Summary of incidental mortality and serious injury of minke whales due to commercial fisheries from 1997 to 2001 and calculation of the estimated mean annual mortality rate.

| Fishery name | Years | Data type | Range of observer coverage | Observed mortality (in given yrs.) | Estimated mortality (in given yrs.) | Mean annual mortality |
|---|---|---|---|---|---|---|
| Bering Sea/Aleutian Is. (BSAI) groundfish trawl | 97-01 | obs data | 62-77% | 0, 0, 0, 1, 0 | 0, 0, 0, 2, 0 | 0.3 (CV = 0.61) |
| Estimated total annual mortality | | | | | | 0.3 (CV = 0.61) |

The Bering Sea/Aleutian Islands groundfish trawl fishery incurred one mortality of a minke whale in 2000; this extrapolates to an estimated 2 minke whale mortalities for that year (Table ~~29~~47). The total estimated mortality and serious injury incurred by this stock as a result of interactions with commercial fisheries is 0.3 (CV = 0.61).

Logbook data are available for part of 1989-1994, after which incidental mortality reporting requirements were modified. Under the new system, logbooks are no longer required; instead, fishers provide self-reports. Data for the 1994-95 phase-in period are fragmentary. After 1995, the level of reporting dropped dramatically, such that the records are considered incomplete and estimates of mortality based on them represent minimums (see Appendix 7 for details). There have been no logbook reports or self-reports of minke whales seriously injured or killed incidental to any fishery in Alaska.

**Subsistence/Native Harvest Information**

No minke whales were ever taken by the modern shore-based whale fishery in the eastern North Pacific which lasted from 1905 to 1971 (Rice 1974). Subsistence takes of minke whales by Alaska Natives are rare, but have been known to occur. Only seven minke whales are reported the have been taken for subsistence by Alaska Natives between 1930 and 1987 (C. Allison, pers. comm., International Whaling Commission, United Kingdom). The most recent harvest (2 whales) in Alaska occurred in 1989 (Anonymous 1991). Based on this information, the annual subsistence take averaged zero minke whales during the 3-year period from 1993 to 1995.

## STATUS OF STOCK

Minke whales are not listed as "depleted" under the MMPA or listed as "threatened" or "endangered" under the Endangered Species Act. The greatest uncertainty regarding the status of the Alaska minke whale stock has to do with the uncertainty pertaining to the stock structure of this species in the eastern North Pacific. Because minke whales are considered common in the waters off Alaska and because the number of human-related removals is currently thought to be minimal, this stock is not considered a strategic stock. Reliable estimates of the minimum population size, population trends, PBR, and status of the stock relative to OSP are currently not available.

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Revised ~~4/30/03~~1/9/05

**NORTH PACIFIC RIGHT WHALE (*Eubalaena japonica*):**
**Eastern North Pacific Stock**

## STOCK DEFINITION AND GEOGRAPHIC RANGE

A comprehensive review of all 20th century sighting, catches and strandings of North Pacific right whales was conducted by Brownell et al. (2001). Data from this review were subsequently combined with historical whaling records to map the known distribution of the species (Clapham et al. 2004). Whaling records indicate that right whales in the North Pacific ranged across the entire North Pacific north of 35°N and occasionally as far south as 20°N (Rosenbaum et al. 2000; Fig. ~~37~~42). Before right whales in the North Pacific were heavily exploited by commercial whalers, concentrations were found in the Gulf of Alaska, eastern Aleutian Islands, southcentral Bering Sea, Sea of Okhotsk, and Sea of Japan (Braham and Rice 1984). During 1965-99~~1958-82~~, following illegal catches by the USSR, there were only 82~~32-36~~ sightings of right whales in the entire eastern North Pacific, with the majority of these occurring in the Bering Sea and adjacent areas of the Aleutian islands (Brownell et al. 2001).~~central North Pacific and Bering Sea (Braham 1986).~~ ~~In the eastern North Pacific, south of 50°N, only 29 reliable sightings were recorded between 1900 and 1994 (Scarff 1986, Scarff 1991, Carretta et al. 1994), and one in 1996 off the tip of Baja, California (Gendron 1999).~~ Sightings have been reported as far south as central Baja California in the eastern North Pacific, as far south as Hawaii in the central North Pacific, and as far north as the sub-Arctic waters of the Bering Sea and Sea of Okhotsk in the summer (Herman et al. 1980, Berzin and Doroshenko 1982, ~~NMFS 1991~~, Brownell et al. 2001).

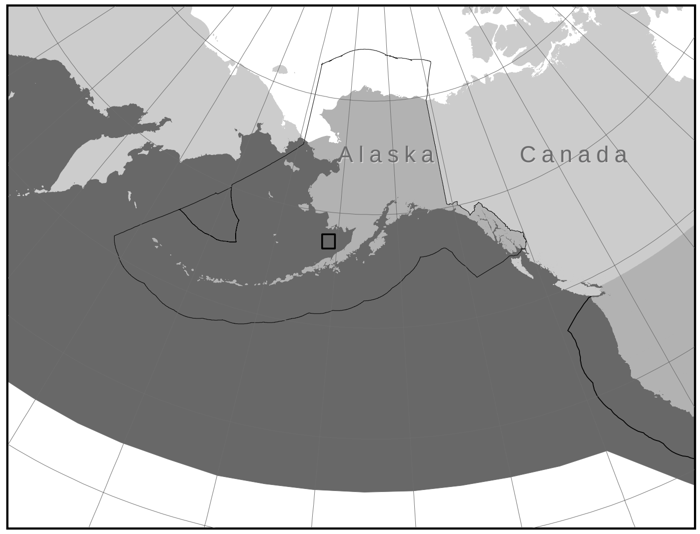


**Figure ~~37~~42.** Approximate historical distribution of North Pacific right whales in the eastern North Pacific (shaded area). The box outlines the area in Bristol Bay where intensive aerial and vessel surveys for right whales have occurred from 1999 to 200~~2~~4.

North Atlantic (*E. glacialis*) and southern hemisphere (*E. australis*) ~~R~~right whales calve in coastal waters during the winter months. However, in the eastern North Pacific no such calving grounds ~~were~~have ever been found (Scarff 1986). Migratory patterns of the North Pacific stock are unknown, although it is thought the whales ~~spend the summer on~~migrate from high-latitude feeding grounds ~~and migrate~~in summer to more temperate waters during the winter, possibly offshore (Braham and Rice 1984, Clapham et al. 2004).

Information on the current seasonal distribution of right whales is available from dedicated vessel and aerial surveys, bottom-mounted acoustic recorders, and vessel surveys for fisheries ecology and management which have also included dedicated marine mammal observers. Aerial and vessel surveys for right whales have occurred in recent years in a portion of ~~Bristol Bay~~the Southeastern Bering Sea (Fig. 41) where right whales have been observed each summer since 1996 (Goddard and Rugh 1998)~~(Fig. 37)~~. North Pacific right whales are observed consistently in this area, although it is clear from historical and Japanese sighting survey data that right whales often range outside this area and occur elsewhere in the Bering Sea (Clapham et al. 2004, ~~and are not observed on dedicated vessel or aerial survey tracklines along the periphery of the area or outside the area (~~Tynan 1999; LeDuc et al. ~~2000~~2001; Moore et al. 2000; Moore et al. 2002; NMFS unpublished data). Bottom-mounted acoustic recorders were deployed in ~~Bristol Bay~~the southeastern Bering Sea and the northern Gulf of Alaska ~~in 2000~~starting in 1999 to document the seasonal distribution of right whale calls (Mellinger et al. 2004). Preliminary analysis of the data from the recorders indicates that right whales remain in the southeastern Bering Sea at least through ~~October~~November (~~L. Munger, Scripps Institute of Oceanography, pers. com.~~Munger et al. 2003). Right whales have not been observed outside the localized area in the southeastern Bering Sea during surveys conducted for fishery management purposes which covered a broader area of Bristol Bay and the Bering Sea (Moore et al. 2000, 2002; see Fig. ~~35~~39 for locations of tracklines for these surveys).

The following information was considered in classifying stock structure according to the Dizon et al. (1992) phylogeographic approach: 1) Distributional data: distinct geographic distribution; 2) Population response data: unknown; 3) Phenotypic data: unknown; and 4) Genotypic data: unknown. Based on this limited information, two stocks of North Pacific right whales are currently recognized: a Sea of O~~t~~khotsk stock and an eastern North Pacific Stock (Rosenbaum et al.~~,~~ 2000, Brownell et al. 2001).

**POPULATION SIZE**

~~The pre-exploitation size of this stock exceeded 11,000 animals (NMFS 1991).~~ Based on sighting data, Wada (1973) estimated a total population of 100-200 in the North Pacific. Rice (1974) stated that only a few individuals remained in the eastern North Pacific stock, and that for all practical purposes the stock was extinct because no sightings of a cow with calf had~~ve~~ been confirmed since 1900 (D. Rice, AFSC-NMML-ret., pers. comm.~~, National Marine Fisheries Service~~). Brownell et al. (2001) suggested from a review of sighting records that the abundance of this species in the western North Pacific was likely in the "low hundreds". A reliable estimate of abundance for the North Pacific right whale stock is currently not available.

~~There have been several recent sightings of right whales in the North Pacific.~~There were several sightings of North Pacific right whales in the mid-1990s which renewed interest in conducting dedicated surveys for this species. ~~O~~In April ~~2,~~ 1996 a right whale was sighted off of Maui (~~D. Salden, pers. comm., Hawaii Whale Research Foundation~~Salden and Mickelsen 1999). This was the first documented sighting of a right whale in Hawaiian waters since 1979 (Herman et al. 1980, Rowntree et al. 1980). ~~More importantly, a~~A group of 3-4 right whales was sighted in western Bristol Bay, southeastern Bering Sea in, ~~(~~July ~~30,~~ 1996~~)~~ which may have included a juvenile animal (Goddard and Rugh 1998). During July 1997, a group of 4-5 individuals was encountered one evening in Bristol Bay, followed by a second sighting of 4-5 whales the following morning in approximately the same location (Tynan 1999). During dedicated surveys in July 1998, July 1999, and July 2000, ~~six, five, and eight~~5, 6, and 13 right whales~~, respectively~~, were again found in the same general region of the southeastern Bering Sea (Leduc et al. ~~2000~~2001)~~ and W. Perryman. pers. comm., National Marine Fisheries Service~~). Biopsy samples of right whales encountered in the southeastern Bering Sea were taken in 1997 and 1999. Genetics analyses identified 3 individuals in 1997 and 4 individuals in 1999; of the animals identified, one was identified in both years, resulting in a total genetic count of 6 individuals (LeDuc et al. 2001). Genetic analyses on samples from all ~~5~~6 whales ~~seen~~sampled in 1999 determined that the animals were ~~all~~ male (LeDuc et al.~~,~~ 200~~0~~1). Two right whales were observed during a vessel-based survey in the central Bering Sea in July 1999 (Moore et al. 2000).

Aerial photogrammetric analyses indicated that one of the animals was seen in 1997, 1998, and 1999~~ was also seen in 1998~~ (LeDuc et al.~~,~~ 200~~0~~1). Body lengths of 12 animals ranged from 14.7 to 17.6m (LeDuc et al. 2001); since body length at sexual maturity has been estimated at about 15 m, LeDuc et al. (2001) hypothesize that all measured animals may have been sexually mature. ~~Two right whales were recorded during a vessel-based survey in the central Bering Sea in July of 1999 (Moore et al., 2000). Of the eight whales seen during the July 2000 aerial survey, 6 were new animals which had not been seen previously, one was a re-sight, and one could not be reliably identified (R. LeDuc, pers. comm., National Marine Fisheries Service).~~

Preliminary information from the Bristol Bay survey in 2002 indicates that there were seven sightings of right whales; it is not yet known how many of these animals were seen in previous years (NMFS, unpublished data). One of the sightings in 2002 included a right whale calf; this is the first confirmed sighting of a calf in decades (a possible calf or juvenile sighting was also reported in Goddard and Rugh 1998). It is notable that~~, with the exception of one right whale observed south of Kodiak Island in 1998 (Waite et al. 2002),~~ all recent right whale sightings in the Bering Sea ~~Alaskan waters~~ have occurred in the small area depicted on the distribution map (Fig. ~~37~~41~~ this box~~, despite substantially increased aerial and vessel survey effort in other parts of the Bering Sea~~ and Gulf of Alaska~~ in recent years.

There are fewer recent sightings of right whales in the Gulf of Alaska than in the Bering Sea (Brownell et al. 2001). Waite et al. (2003) summarized sightings from the Platforms of Opportunity Program from 1959-97. Seven sightings of right whales were reported, but only one sighting of 4 right whales at the mouth of Yakutat Bay in 1979 could be positively confirmed (Waite et al. 2003). A sighting of a right whale off Kodiak Island in 1998 occurred during an aerial survey. This sighting prompted researchers to plan an acoustic monitoring study off Kodiak Island during 2000; results from recordings made between 26 May and 11 September include one series of calls in early September that may have been from a right whale (Waite et al. 2003). Research efforts in 2004 led to the placement of satellite tags on two North Pacific right whales in the Bering Sea (P. Wade, AFSC-NMML, pers.

comm.). A few weeks later, the locations of these whales was provided to staff on a Southwest Fisheries Science Center vessel cruise in the southern Bering Sea; although the tagged animals could not be relocated, other right whales in the area were observed. Data on the number of animals in this group are not yet available (W. Perryman, NMFS-SWFSC, pers. comm.).

**Minimum Population Estimate**

At this time, it is not possible to produce a reliable estimate of minimum abundance for this stock, as a current estimate of abundance is not available. However, it is worth noting that~~, although only~~of ~~14~~13 individual animals ~~have been~~ photographed during aerial surveys ~~during~~in 1998, 1999, and 2000, ~~there have already been~~ two ~~occurrences of animals which~~ have already been rephotographed ~~in more than one year~~ (LeDuc et al. 2001). This "mark-recapture" success rate is consistent with a very small population size.

**Current Population Trend**

A reliable estimate of trend in abundance is currently not available.

**CURRENT AND MAXIMUM NET PRODUCTIVITY RATES**

Due to insufficient information, it is recommended that the default cetacean maximum net productivity rate ($R_{MAX}$) of 4% be employed for this stock (Wade and Angliss 1997). However, this default rate is likely an underestimate based on the work reported by Best (1993).

**POTENTIAL BIOLOGICAL REMOVAL**

Under the 1994 reauthorized Marine Mammal Protection Act (MMPA), the potential biological removal (PBR) is defined as the product of the minimum population estimate, one-half the maximum theoretical net productivity rate, and a recovery factor: $PBR = N_{MIN} \times 0.5R_{MAX} \times F_R$. The recovery factor ($F_R$) for this stock is 0.1, the recommended value for cetacean stocks which are listed as endangered (Wade and Angliss 1997). ~~However, because a reliable estimate of minimum abundance is currently not available, the PBR for this stock is unknown.~~ A reliable estimate of minimum abundance is not available for this stock but it is certainly very small. The PBR level for this stock is considered zero.

**ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY**

**Fisheries Information**

Gillnets were implicated in the death of a right whale off the Kamchatka Peninsula (Russia) in October of 1989 (Kornev 1994). No other incidental takes of right whales are known to have occurred in the North Pacific. Any mortality incidental to commercial fisheries would be considered significant. Entanglement in fishing gear, including lobster pot and sink gillnet gear, is a significant source of mortality for the North Atlantic right whale stock (Waring et al. 2004).

Based on the ~~lack of reported mortalities~~available records, the estimated annual mortality rate incidental to commercial fisheries ~~is~~approaches zero whales per year from this stock. Therefore, the annual human-caused mortality level is considered to be insignificant and approaching a zero mortality and serious injury rate.

**Subsistence/Native Harvest Information**

Subsistence hunters in Alaska and Russia are not reported to take animals from this stock.

**Other Mortality**

Right whales are large, slow-swimming, tend to congregate in coastal areas, and have a thick layer of blubber which enables them to float when killed. These attributes made them an easy and profitable species for early (pre-modern) whalers. By the time the modern (harpoon cannons and steam powered catcher boats) whale fishery began in the late 1800s, right whales were rarely encountered (Braham and Rice 1984). Between 1835 and 1909, an estimated 15,374 right whales were taken from the North Pacific by American-registered whaling vessels, with most of those animals taken prior to 1875 (Best 1987, IWC 1986). From 1900 to 1999, a total of 742 right whales were killed by whaling; of those, 331 were killed in the western North Pacific and 411 in the eastern North Pacific (Brownell et al. 2001). The latter total includes 372 whales killed illegally by the USSR in the period 1963-67, primarily in the Gulf of Alaska and Bering Sea (Doroshenko 2000, Brownell et al. 2001).~~In addition, 28 right whales were killed between 1914 and 1951 in Alaskan and British Columbian waters (Reeves et al. 1985). The~~

~~estimated mortality likely underestimates the actual kill as a result of under-reporting of the Soviet catches (Yablokov 1994).~~

Ship strikes ~~and entanglement in fishing gear~~ are significant sources of mortality for the North Atlantic stock of right whales, and it is possible that right whales in the North Pacific are also vulnerable to these sources of mortality. However, due to their rare occurrence and scattered distribution it is impossible to assess the threat of ship strikes ~~or entanglement~~ to the North Pacific stock of right whales at this time.

**STATUS OF STOCK**

The right whale is listed as "endangered" under the Endangered Species Act of 1973, and therefore designated as "depleted" under the MMPA. ~~NMFS now considers the North Pacific animals to be distinct at the species level from North Atlantic animals.~~ As a result, the stock is classified as a strategic stock. Reliable estimates of the minimum population size, population trends, and PBR are currently not available. Though reliable numbers are not known, the abundance of this stock is considered to represent only a small fraction of its precommercial whaling abundance (i.e., the stock is well below its Optimum Sustainable Population size). The estimated annual rate of human-caused mortality and serious injury seems minimal for this stock. The reason(s) for the apparent lack of recovery for this stock is (are) unknown. Brownell et al. (2001) noted the devastating impact of extensive illegal Soviet catches in the eastern North Pacific in the 1960s, and suggested that the prognosis for right whales in this area was "poor". In its review of the status of right whales worldwide, the International Whaling Commission expressed "considerable concern" over the status of this population (IWC 2001).

On 4 October 2000, NMFS received a petition from the Center for Biological Diversity to designate critical habitat for this stock. Petitioners asserted that the southeast Bering Sea shelf from 55-60° N latitude should be considered critical habitat. On 1 June 2001, NMFS found the petition to have merit (66 FR 29773). On 20 February 2002, NMFS announced a decision to not designate critical habitat for North Pacific right whales (67 FR 7660) at this time. NMFS concluded that the information available did not indicate that the physical or biological features essential to the conservation of the species exist throughout the petitioned area, and that a smaller area may contain essential physical and biological features, but the boundary of this smaller area could not yet be defined. Thus, NMFS determined that critical habitat was undeterminable at this time. However, NMFS will be evaluating new information collected during recent field studies ~~conducted in 2002,~~ and may propose to designate critical habitat at that time if the new information indicates that certain areas are critical for the conservation of the species and require special management considerations.

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**BOWHEAD WHALE (*Balaena mysticetus*): Western Arctic Stock**

~~**PRELIMINARY DRAFT: Need to include text in caption for Table 30 re. why these estimates were used in lieu of others for the same year; need to update table 31 & #s of takes in fisheries, if necessary; need the CV for the abundance estimate to calculate a new PBR level. rpa 11/13/03**~~

## STOCK DEFINITION AND GEOGRAPHIC RANGE

Western Arctic ~~B~~bowhead whales are distributed in seasonally ice-covered waters of the Arctic and near-Arctic, generally north of ~~54°N~~60°N and south of 75°N in the western Arctic Basin (Braham 1984, Moore and Reeves 1993). For management purposes, five stocks of bowhead whales ~~are currently~~have been recognized by the International Whaling Commission (IWC 1992). Small stocks occur in the Sea of Okhotsk, Davis Strait, Hudson Bay, and the offshore waters of Spitsbergen. These small bowhead stocks are comprised of only a few tens to a few hundreds of individuals (~~Braham 1984, Shelden and Rugh 1995~~, Shelden and Rugh 1995, Zeh et al. 1993). The largest population, and the only stock that is found within U. S. waters, is the Western Arctic stock (Fig. ~~38~~43), also know as the Bering-Chukchi-Beaufort stock (Rugh et al. 2003) or Bering Sea stock (Burns et al. 1993). The majority of the Western Arctic stock migrates annually from wintering areas (November to March) in the northern Bering Sea, through the Chukchi Sea in the spring (March through June), to the Beaufort Sea where they spend much of the summer (mid-May through September) before returning again to the Bering Sea in the fall (September through November) to overwinter (Braham et al. 1980, Moore and Reeves 1993). The bowhead spring migration follows fractures in the sea ice around the coast of Alaska, generally in the shear zone between the shorefast ice and the mobile polar pack ice. There is evidence of whales following each other, even when their route does not take advantage of large ice-free areas, such as polynyas (Rugh and Cubbage 1980). As the whales travel east past Point Barrow, Alaska, their migration is somewhat funneled between shore and the polar pack ice, making for an optimal location from which to study this stock (Krogman 1980). Most of the year, bowhead whales are closely associated with sea ice (Moore and Reeves 1993). Only during the summer is this population in relatively ice-free waters in the southern Beaufort Sea, an area often exposed to industrial activity related to petroleum exploration and extraction (e.g. Richardson et al. ~~1985~~1987, ~~Treacy 2002~~Davies 1997). During the autumn migration, bowheads select shelf waters in all but "heavy ice" conditions, when they select slope habitat (Moore 2000). Sightings of bowhead whales do occur in the summer near Barrow (Moore 1992, Moore and DeMaster 2000) and are consistent with suggestions that certain areas near Barrow are important feeding grounds. Some bowheads are found in the Chukchi and Bering Seas in summer, and these are thought to be a part of the expanding W~~we~~estern Arctic stock (Rugh et al. ~~2000~~2003). However, more research needs to be done to determine whether or not there are substocks within the Western Artic stock (IWC 2004)

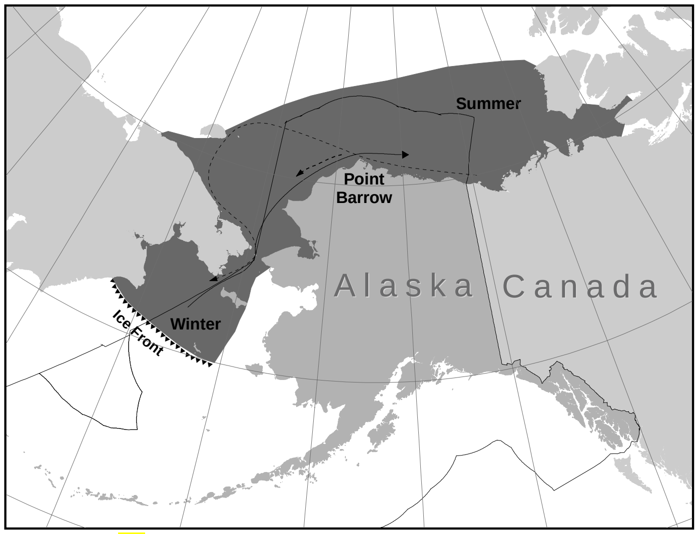


**Figure ~~38~~43.** Approximate distribution of the Western Arctic stock bowhead whales (shaded area). Winter, summer, and spring/fall distributions are depicted (see text).

## POPULATION SIZE

All stocks of bowhead whales were severely depleted during intense commercial whaling prior to the 20th century, starting in the early 16th century near Labrador (Ross 1993) and spreading to the Bering Sea in the mid-19th century (Braham 1984, Bockstoce and Burns 1993). Woodby and Botkin (1993) summarized previous efforts to approximate how many bowheads there were prior to the onset of commercial whaling. They reported a minimum worldwide population estimate of 50,000, with 10,400-23,000 in the Western Arctic stock (dropping to less than 3,000 at the end of commercial whaling).

Since 1978, systematic counts of bowhead whales have been conducted from sites on sea ice north of Point Barrow during the whales' spring migration (Krogman et al. 1989). These counts have been corrected for whales missed due to distance offshore (through acoustical methods, described in Clark et al. 1994), whales missed when no watch was in effect, and whales missed during a watch (estimated as a function of visibility, number of observers, and distance offshore; Zeh et al. ~~1994~~1993). A summary of the resulting abundance estimates ~~determined using ice-based census techniques corrected by acoustic methods~~ is provided in Table ~~30~~48. However, these estimates of abundance have not been corrected for a small portion of the population that may not migrate past Point Barrow in spring. ~~In 1993, the census resulted in a population estimate of 8,000 (CV = 0.073), with a 95% confidence interval from 6,900 to 9,200 (Zeh et al. 1994). A refined and larger sample of acoustic data from 1993 resulted in an estimate of 8,200 animals (CV = 0.069; 95% CI = 7,200-9,400; ), which is considered the best estimate for the population in 1993 (IWC 1996, Zeh et al. 1995). The bowhead census in 2001 resulted in a preliminary estimate of 9,860 (95% CI = 7,700-12,600; CV = 0.12)10,020 (95% CI = 7,800-12,900; CV = xxx), despite poor visibility conditions, an increase in whale distance from shore, and an increase in variability in offshore distribution relative to conditions during the 1993 census (George et al. 20022003). This estimate will be further refined by incorporating additional information on acoustic locations~~.

**Table ~~30~~48.** Summary of population abundance estimates for the western Arctic stock of bowhead whales. ~~The 95% confidence intervals, when available, is provided in parentheses.~~ The historical estimates were made by back-projecting using a simple recruitment model. All other estimates were developed by correct~~ing~~ed ice-based census counts ~~using acoustic methods. An asterisk (*) identifies those estimates which result from an ice based census, but are not corrected by acoustic methods. Other methods have been used to estimate population size; these are discussed in the text.~~ Historical estimates (prior to and after commercial whaling) are from Woodby and Botkin (1993); 1978-2001 estimates are from Zeh and Punt (2004).

| Year | ~~Population~~ Abundance ~~E~~estimate ~~(CV)~~ | Year | Abundance estimate (CV) |
|---|---|---|---|
| Historical estimate | 10,400-23,000 | 1985 | ~~6,039 (3,300-11,100)*~~5,762 (0.253) |
| End of commercial whaling | 1000-3000 | 1986 | ~~10,300 (8,100-12,900)~~8,917 (0.215) |
| 1978 | ~~5,189~~ 4,765 (0.305) | 1987 | 5,298 (0.327) |
| 1980 | ~~4,198~~3,885 (0.343) | 1988 | ~~6,579 (5,300-8,200)~~6,928 (0.120) |
| 1981 | ~~4,956~~4,467 (0.273) | 1993 | ~~8,200 (7,200-9,400)~~8,167 (0.017) |
| 1982 | ~~7,074~~7,395 (0.281) | 2001 | ~~9,860 (7,700-12,600)*~~ 10,545 (0.128) |
| 1983 | ~~6,747~~6,573 (0.345) | | |

Aerial photo-identification of bowhead whales photographed in 1985 and 1986 and a capture-recapture analytical approach ~~provides an alternative method for estimating abundance. This approach~~ provided estimates of 4,719 (95% CI = 2,382-9,343) to 7,022 (95% CI = 4,701-12,561), depending on the model used (daSilva et al. 2000). These population estimates and their associated error ranges are comparable to the estimates obtained from the combined ice-based visual and acoustic data~~estimates of 6,039 and 7,734,~~ for 1985 (5,762) and 1986 (8,917)~~, respectively (Raftery and Zeh 1994)~~. ~~Although t~~This study ~~does not provide an update to the abundance estimate provided in Zeh et al. (1995), it~~ does demonstrate that the use of aerial photo-identification to estimate a population size for bowhead whales provides a reasonable alternative to the traditional ~~approach of using~~ ice-based census and acoustic ~~census~~ techniques.

**Minimum Population Estimate**

The minimum population estimate ($N_{MIN}$) for this stock is calculated from Equation 1 from the PBR Guidelines (Wade and Angliss 1997): $N_{MIN} = N/\exp(0.842\times[\ln(1+[CV(N)]^2)]^{½})$. Using the most recent ~~preliminary~~

population estimate (N) of ~~9,860~~10,545 and its associated CV(N) of ~~0.124xxxx~~0.128, $N_{MIN}$ for the Western Arctic stock of bowhead whales is ~~8,886~~9,472.

**Current Population Trend**

Raftery et al. (1995) reported the Western Arctic stock of bowhead whales increased at a rate of 3.1% (95% CI = 1.4-4.7%) from 1978 to 1993, during which time abundance increased from approximately 5,000 to approximately 8,000 whales. This rate of increase takes into account whales that passed beyond the viewing range of the ice-based observers. ~~Inclusion of the revised 1993 abundance estimate results in a similar, though slightly higher rate of 3.2% population increase (95% CI = 1.4-5.1%) during the 1978-93 period (IWC 1996).~~ The inclusion of the ~~new preliminary~~ estimate for 2001 results in a rate of increase of ~~3.3~~3.5% (95% CI ~~2-4.7~~2.2 to 4.9%; Brandon and Wade 2004) or 3.4% (95% CI 1.7 to 5% George et al. in press), ~~which is essentially identical~~similar to previous estimates. The count of 121 calves during the 2001 census was the highest yet recorded and, was likely caused by a combination of variable recruitment and the large population size (George et al. ~~2002~~in press), ~~and~~ provides corroborating evidence for a healthy and increasing population.

## CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

The current estimate for the rate of increase for this stock of bowhead whales (3.3%) should not be used as an estimate of ($R_{MAX}$) because the population is currently being harvested and because the population has recovered to population levels where the growth is expected to be significantly less than $R_{MAX}$. It is recommended that the cetacean maximum theoretical net productivity rate ($R_{MAX}$) of 4% be employed for the Western Arctic stock of bowhead whale (Wade and Angliss 1997).

## POTENTIAL BIOLOGICAL REMOVAL

Under the 1994 reauthorized Marine Mammal Protection Act (MMPA), the potential biological removal (PBR) level is defined as the product of the minimum population estimate, one-half the maximum theoretical net productivity rate, and a recovery factor: PBR = $N_{MIN} \times 0.5R_{MAX} \times F_R$. The recovery factor ($F_R$) for this stock is 0.5 rather than the default value of 0.1 for endangered species because population levels are increasing in the presence of a known take (see guidelines Wade and Angliss 1997). Thus, PBR = ~~89~~95 animals (~~8,886~~9,472 $\times$ 0.02 $\times$ 0.5). The development of a PBR level for the Western Arctic bowhead stock is required by the MMPA even though the subsistence harvest is managed under the authority of the International Whaling Commission (IWC). Accordingly, the IWC bowhead whale quota takes precedence over the PBR estimate for the purpose of managing the Alaska Native subsistence harvest from this stock. For 2002-07, a block quota of 280 bowhead strikes will be allowed, of which 67 (plus up to 15 unharvested in the previous year) could be taken each year. This quota includes an allowance of 5 animals to be taken by Chukotka Natives in Russia.

## ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

**Fisheries Information**

Several cases of rope or net entanglement have been reported from whales taken in the subsistence hunt, including those summarized in Table ~~28~~49 (Philo et al. 1993). Further, preliminary counts of similar observations based on reexamination of bowhead harvest records indicate entanglements or scarring attributed to ropes may include over 20 cases (Craig George, pers. comm., Department of Wildlife Management, North Slope Borough). There are no observer program records of bowhead whale mortality incidental to commercial fisheries in Alaska. ~~Logbook data are available for part of 1989-94, after which incidental mortality reporting requirements were modified. Under the new system, logbooks are no longer required; instead, fishers provide self-reports. Data for the 1994-95 phase-in period is fragmentary. After 1995, the level of reporting dropped dramatically, such that the records are considered incomplete and estimates of mortality based on them represent minimums (see Appendix 7 for details).~~

~~New information on entanglements of~~Some bowhead whales ~~indicate that animals do~~ have had interactions with crab pot gear (Table ~~31~~49). ~~There have been two confirmed occurrences of entanglement in crab pot gear~~, one in 1993 and one in 1999. ~~;~~ ~~t~~The average rate of entanglement in crab pot gear for ~~1997-2001~~1999-2003 is 0.2.

**Table ~~31~~49.** Reported scarring of bowhead whales attributed to entanglement in ropes and ship strikes and description of observations collected during subsistence harvests in Alaska since 1978 (Philo et al. 1993; * D. Rugh, personal communication, National Marine Fisheries Service; ** C. George, personal communication, North Slope Borough).

| Year | Number of Whales | Location | Description |
|---|---|---|---|
| 1978 | 1 | Wainwright | 6 scars on caudal peduncle |
| 1986 | 1 | Kaktovik | Scars on caudal peduncle and anterior margin of flukes |
| 1989 | 1 | Barrow | 12 scars on ridges of caudal peduncle |
| 1989 | 1 | south of Gambell | Rope wrapped around head, through mouth and baleen |
| 1989* | 1 | Barrow | Rope ~32m long trailing from mouth |
| 1990 | 1 | Barrow | Scars on caudal peduncle; 2 ropes trailing from mouth. |
| 1991* | 1 | Barrow | Apparent rope scar from mouth, across back |
| 1993** | 1 | Barrow | Large female~~,~~ with crab pot line wrapped around flukes |
| 1998** | 1 | NW of Kotzebue; near Red Dog Mine dock | Stranded - dead with line on it |
| 1999** | 1 | Barrow | Whale entangled in confirmed crab gear. Line wrapped through gape of mouth, flipper, and peduncle. Severe injuries. |
| 2003** | 1 | Near Ugashik | Stranded with rope tied around the peduncle; entangled? |
| 2004** | 1 | Kaktovik | Boat propeller marks |

**Subsistence/Native Harvest Information**

Eskimos have been taking bowhead whales for at least 2,000 years (Marquette and Bockstoce 1980, Stoker and Krupnik 1993). Subsistence takes have been regulated by a quota system under the authority of the IWC since 1977. Alaska Native subsistence hunters take approximately 0.1-0.5% of the population per annum, primarily from nine Alaska communities (Philo et al. 1993). Under this quota, the number of kills has ranged between 14-72 per year, depending in part on changes in management strategy and in part on higher abundance estimates in recent years (Stoker and Krupnik 1993). ~~The following statistics were compiled from animals taken in the subsistence harvest between 1973 and 1992: 1) the sex ratio of bowheads taken in the hunt was equal; 2) the proportion of adult females taken in the hunt increased from 5% in the early 1970s to over 20% in the late 1980s and early 1990s; 3) approximately 80% of the catch was immature animals prior to 1978 and since has been approximately 60%; and 4) modern Native whalers appear to harvest larger bowheads than precontact (prior to 1849) Native whalers (Braham 1995).~~ Suydam and George (2004) summarize Alaskan subsistence harvest of bowheads from 1974 to 2003. A total of 832 whales were landed by hunters from 11 villages. Barrow landed the most whales (n = 418) while Little Diomede and Shaktoolik each only landed one. The number of whales landed at each village varies greatly from year to year, as success is greatly influenced by village size and ice and weather conditions. The efficiency of the hunt has increased since the implementation of the bowhead quota in 1978. In 1978 the efficiency was about 50%, and is currently about 85%. The size of landed whales differs among villages. Gambell and Savoonga, villages on St. Lawrence Island and Wainright harvest larger whales than Point Hope and Barrow. These differences are likely due to hunter selectivity and/or whale availability. Also, the size of landed whales changes during the migration of some villages. For example, during spring in Barrow, smaller whales are caught earlier in the season than larger whales (Suydam and George 2004). Overall, the sex ratio of the harvest is equal.

The ~~total take~~number of bowheads landed by Alaska Natives~~, including struck and lost~~, was reported to be ~~66 in 1997, 54 in 1998, 47~~42 in 1999, ~~47~~35 in 2000, ~~and 75~~49 in 2001, 37 in 2002, and 35 in 2003 (~~Alaska Eskimo Whaling Commission, unpubl. data, AEWC, P. O. Box 570, Point Barrow, AK 99723; 2001 data provided by Suydam et al. 2002~~Suydam and George 2004). Canadian Natives are also known to take whales from this stock. Hunters from the western Canadian Arctic community of Aklavik killed one whale in 1991 and one in 1996. The annual average subsistence take (by Natives of Alaska and Canada) during the 5-year period from ~~1997 to 2001~~1999 to 2003 is ~~58~~40 bowhead whales. One animal was harvested by Russian subsistence hunters in each of 1999 and 2000 ~~(IWC, In press update)~~and 3 in 2003 (Borodin 2004).

**Other Mortality**

Pelagic commercial whaling for bowheads principally occurred in the Bering Sea from 1848 to 1919. Within the first two decades of the fishery (1850-1870), over 60% of the stock was harvested, although effort remained high into the 20th century (Braham 1984). It is estimated that the pelagic whaling industry harvested 18,684 whales from this stock (Woodby and Botkin 1993). During 1848-1919, shore-based whaling operations (including landings as well as struck and lost estimates from U. S., Canadian, and Russian shores) took an additional 1,527 animals (Woodby and Botkin 1993). An unknown percentage of the animals taken by the shore-based operations were harvested for subsistence, and not commercial purposes. The estimated mortality likely underestimates the actual kill as a result of under-reporting of the Soviet catches (Yablokov 1994), and the lack of reports on struck and lost animals.

**STATUS OF STOCK**

Based on currently available data, the estimated annual mortality rate incidental to commercial fisheries (0.2) is not known to exceed 10% of the PBR (~~8.9~~9.4) and, therefore, can be considered to be insignificant ~~and approaching a zero mortality and serious injury rate~~. The annual level of human-caused mortality and serious injury (~~58~~41) is not known to exceed the PBR (~~89~~95) nor the IWC ~~quota~~annual maximum (67). The Western Arctic bowhead whale stock has been increasing in recent years; the current ~~preliminary~~ estimate of ~~9,860~~10,545 is between ~~43~~19% and ~~95~~105% of the ~~estimated~~ pre-exploitation abundance~~ of 10,400-23,000~~ (estimates ranging roughly from 10,000 to 55,000) and this stock may now be approaching its carrying capacity (Brandon and Wade 2004). However, the stock is classified as a strategic stock because bowhead whale is listed as "endangered" under the Endangered Species Act (ESA)~~,~~ and therefore also designated as "depleted" under the MMPA. The development of criteria for recovery of large whales in general (Angliss et al. 2002) and bowhead whales in particular (Shelden et al. 2001) ~~and~~ will be used in the next 5-year evaluation of stock status.

**Habitat Issues**

Increasing oil and gas development in the Arctic ~~will lead~~has led to an increased risk of various forms of pollution to bowhead whale habitat, including oil spills, toxic and nontoxic waste, and noise due to higher levels of traffic as well as exploration and drilling operations. Evidence indicates that bowhead whales are sensitive to noise from offshore drilling platforms and seismic survey operations (Richardson and Malme 1993, Richardson 1995; Davies 1997), and that the presence of an active drill rig (Schick and Urban 2000) or seismic operations (Miller et al. 1999) will cause bowhead whales to avoid the vicinity. Figure 2b in Schick and Urban (2000) demonstrates, however, that the area of disturbance is localized. Recent studies conducted as part of a monitoring program for the Northstar project (a drilling facility located on an artificial island in the Beaufort Sea) indicate that, in one of the three years of monitoring efforts, the southern edge of the bowhead whale fall migration path may have been slightly (2-3mi) further offshore during periods when higher sound levels were recorded; there was no significant effect of sound on the migration path during the other two monitored years (Richardson et al. 2004). Evidence indicated that deflection of the southern portion of the migration in 2001 occurred during periods when there were certain vessels in the area, and did not occur as a result of sound emanating from the Northstar facility itself. ~~However, since~~Because the bowhead whale population is approaching its pre-exploitation population size and has been documented to be increasing at a roughly constant rate for over 20 years, the impacts of oil and gas industry on individual survival and reproduction are likely to be minor.

Another element of concern is the potential for Arctic climate change, which will probably affect high northern latitudes more than elsewhere. There is evidence that over the last 10-15 years, there has been a shift in regional weather patterns in the Arctic region (Tynan and DeMaster 1997). Ice-associated animals, such as the bowhead whale, may be sensitive to changes in Arctic weather, sea-surface temperatures, or ice extent, and the concomitant effect on prey availability. There are insufficient data to make reliable predictions of the effects of Arctic climate change on bowhead whales.

On 22 February 2000, NMFS received a petition from the Center for Biological Diversity and Marine Biodiversity Protection Center to designate critical habitat for thi~~s~~e Western Arctic bowhead stock. Petitioners asserted that the nearshore areas from the U.S.~~-~~Canada border to Barrow, Alaska should be considered critical habitat. On 22 May 2001, NMFS found the petition to have merit (66 FR 28141). On 30 August 2002 (67 FR 55767), NMFS announced the decision to not designate critical habitat for this population. NMFS found that designation of critical habitat was not necessary because the population is known to be approaching its pre-commercial whaling population size, the population is increasing, there are no known habitat issues which are slowing the growth of the population, and because activities which occur in the petitioned area are ~~currently~~already managed to minimize impacts to the population.

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# APPENDICES

**Appendix 1.** Summary of changes to the ~~2002~~2005 stock assessments. An 'X' indicates sections where the information presented has been updated since the ~~2001~~2003 SAR was released (last revised ~~7/21/03~~10/31/04).

| Stock | Stock definition | Population size | PBR | Fishery mortality | Subsistence Mortality | Status |
|---|---|---|---|---|---|---|
| Steller sea lion (western US) | | X | X | X | X | |
| Steller sea lion (eastern US) | | X | X | X | X | |
| Northern fur seal | | X | X | X | X | |
| Harbor seal (SE Alaska) | | | | | | |
| Harbor seal (GOA) | | | | | | |
| Harbor seal (Bering Sea) | | | | | | |
| Spotted seal | | | | X | | |
| Bearded seal | | | | X | X | |
| Ringed seal | | | | X | X | |
| Ribbon seal | | | | X | X | |
| Beluga whale (Beaufort) | | | | | X | |
| Beluga whale (E. Chukchi) | | | | | X | |
| Beluga whale (E. Bering Sea) | | | | | X | |
| Beluga whale (Bristol Bay) | | | | | X | |
| Beluga whale (Cook Inlet) | | X | X | | X | |
| Killer whale (Alaska resident) | X | X | X | X | X | X |
| Killer whale (northern resident) | X | X | X | X | X | X |
| ~~Killer whale (transient)~~ | | | | | | |
| Killer whale (AT1) | X | X | X | X | X | X |
| Killer whale (Alaska resident) | X | X | X | X | X | X |
| Killer whale (Gulf of Alaska, Bering Sea, Aleutian Islands) | X | X | X | X | X | X |
| Killer whale (west coast transient) | X | X | X | X | X | X |
| Pacific white-sided dolphin | | X | X | X | | |
| Harbor porpoise (SE Alaska) | | ~~X~~ | ~~X~~ | ~~X~~ | | |
| Harbor porpoise (GOA) | | ~~X~~ | ~~X~~ | ~~X~~ | | |
| Harbor porpoise (Bering Sea) | | ~~X~~ | ~~X~~ | ~~X~~ | | |
| Dall's porpoise | | X | X | X | | |
| Sperm whale | | | | X | | |
| Baird's beaked whale | | | | | | |
| Cuvier's beaked whale | | | | | | |
| Stejneger's beaked whale | | | | | | |
| Gray whale | | X | X | X | X | |
| Humpback whale (western) | | | | X | | |
| Humpback whale (central) | | X | X | X | | |
| Fin whale | | X | X | X | | |
| Minke whale | | | | | | |
| North Pacific right whale | | X | | | | |
| Bowhead whale | | X | X | X | X | |

**Appendix 2:** Stock summary table (last revised ~~6/12/03~~11/5/04). Stock assessment reports for those stocks in boldface were updated in the ~~2003~~2005 draft SARs.

| Species | Stock | N (est) | CV | C.F. | CV C.F. | Comb. CV | N(min) | 0.5 Rmax | F(r) | PBR | Fishery mort. | Subsist mort. | Status |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Baird's beaked whale** | **Alaska** | n/a | | | | | n/a | 0.02 | 0.50 | n/a | 0 | see txt | NS |
| **Bearded seal** | **Alaska** | n/a | | | | | n/a | 0.06 | 0.50 | n/a | ~~1~~2 | 6,788 | NS |
| **Beluga whale** | **Beaufort Sea** | 39,258 | 0.229 | 2.00 | n/a | 0.229 | 32,453 | 0.02 | ~~1.00~~ 0.50 | ~~649~~ 324 | 0 | ~~177~~ 162 | NS |
| **Beluga whale** | **E. Chukchi Sea** | 3,710 | n/a | 3.09 | n/a | n/a | 3,710 | 0.02 | 1.00 | 74 | 0 | ~~60~~ 65 | NS |
| **Beluga whale** | **E. Bering Sea** | 18,142 | 0.24 | 3.09 | n/a | 0.24 | 14,898 | 0.02 | 1.00 | 298 | ~~1*~~0 | ~~164~~ 209 | NS |
| **Beluga whale** | **Bristol Bay** | 1,888 | n/a | 3.09 | n/a | 0.20 | 1,619 | 0.02 | 1.00 | 32 | ~~1*~~0.5 | ~~15~~ 19 | NS |
| **Beluga whale** | **Cook Inlet** | ~~386~~ 357 | ~~0.087~~ 0.107 | | | ~~0.087~~ 0.107 | ~~359~~ 326 | 0.02 | 0.30 | ~~2.2~~ 2.0 | 0 | ~~0~~ 1 | S |
| **Bowhead whale** | **W. Arctic** | ~~9,860~~ 10,545 | ~~0.124~~ 0.128 | | | ~~0.124~~ 0.128 | ~~8,886~~ 9,472 | 0.02 | 0.50 | ~~89~~ 95 | 0.2 | ~~58~~ 41 | S |
| **Cuvier's beaked whale** | **Alaska** | n/a | | | | | n/a | 0.02 | 0.50 | n/a | 0 | 0 | NS |
| Dall's porpoise | Alaska | 83,400 | 0.097 | | | 0.097 | 76,874 | 0.02 | 1.00 | 1,537 | 37.5 | 0 | NS |
| **Fin whale** | **NE Pacific** | ~~n/a~~ 5703 | 0.2 | | | | ~~n/a~~ 5703 | 0.02 | 0.10 | ~~n/a~~ 11.4 | ~~0.8~~ 0.6 | 0 | S |
| **Gray whale** | **E. N. Pacific** | ~~26,635~~ 18,813 | ~~0.1006~~ 0.069 | | | ~~0.1006~~ 0.069 | ~~24,477~~ 17,752 | 0.0235 | 1.00 | ~~575~~ 442 | ~~8.9~~ 7.4 | ~~97~~ 122 | NS |
| Harbor porpoise | SE Alaska | 10,947 | 0.242 | 1.56$^{+}$ | 0.108$^{+}$ | 0.274 | 8,954 | 0.02 | 0.50 | 90 | 3* | 0 | NS |
| Harbor porpoise | Gulf of Alaska | 30,506 | 0.214 | 1.37$^{+}$ | 0.066$^{+}$ | 0.304 | 25,536 | 0.02 | 0.50 | 255 | ~~25~~ 40.3 | 0 | NS |
| Harbor porpoise | Bering Sea | 47,356 | 0.223 | 1.337$^{+}$ | 0.062$^{+}$ | 0.300 | 39,328 | 0.02 | 0.50 | 393 | 2 | 0 | NS |
| Harbor seal | SE Alaska | 37,450 | 0.026 | 1.74 | 0.068 | 0.073 | 35,226 | 0.06 | 1.00 | 2,114 | 36 | 1,749 | NS |
| Harbor seal | Gulf of Alaska | 29,175 | 0.023 | 1.50 | 0.047 | 0.052 | 28,917 | 0.06 | 0.50 | 868 | 36 | 791 | NS |
| Harbor seal | Bering Sea | 13,312 | 0.062 | 1.50 | 0.047 | see txt | 12,648 | 0.06 | 0.50 | 379 | 31 | 161 | NS |
| **Humpback whale** | **W. N. Pacific** | 394 | 0.084 | | | 0.084 | 367 | ~~0.02~~ 0.035 | 0.10 | ~~0.7~~ 1.3 | ~~0.8~~ 0.69 | 0 | S |
| **Humpback whale** | **CNP - entire stock** | 4,005 | 0.095 | | | 0.095 | 3,698 | ~~0.02~~ 0.035 | 0.10 | ~~7.4~~ 12.9 | 4.2 | 0 | S |
| | **CNP - SEAK feeding area** | 961 | 0.12 | | | 0.12 | 868 | ~~0.02~~ 0.035 | 0.10 | ~~3.5~~ 3 | ~~2.2~~ 2.7 | ~~0~~ | |
| **Killer whale** | **~~E. N. Pacific N.~~ Alaska resident** | ~~723~~ 1,123 | n/a | | | see txt | ~~723~~ 1,123 | 0.02 | 0.50 | ~~7.2~~ 11.2 | ~~1.4~~ 2.5 | 0 | NS |

| Species | Stock | N (est) | CV | C.F. | CV C.F. | Comb. CV | N(min) | 0.5 Rmax | F(r) | PBR | Fishery mort. | Subsist mort. | Status |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Killer whale | Northern resident (British Columbia) | 216 | n/a | | | | 216 | 0.02 | 0.5 | 2.16 | 0.0 | 0 | NS |
| ~~Killer whale~~ | ~~E. N. Pacific transient~~ | ~~346~~ | ~~1.0~~ | | | | ~~346~~ | ~~0.04~~ | ~~0.04~~ | ~~2.8~~ | ~~0.6~~ | ~~0~~ | ~~NS~~ |
| Killer whale | AT1 transient | 8 | n/a | | | | 8 | 0.02 | 0.50 | 0 | 0 | 0 | S |
| Killer whale | GOA, AI, BS transient | 314 | n/a | | | | 314 | 0.02 | 0.5 | 3.1 | 2.5 | 0 | NS |
| Killer whale | West Coast transient | 314 | n/a | | | | 314 | 0.02 | 0.5 | 3.1 | 0 | 0 | NS |
| Minke whale | Alaska | n/a | | | | | n/a | 0.02 | 0.50 | n/a | 0.3 | 0 | NS |
| North Pacific right whale | E. N. Pacific | n/a | | | | | n/a | 0.02 | 0.10 | n/a | 0 | 0 | S |
| Northern fur seal | E. North Pacific | ~~888,120~~ 688,028 | | 4.475 | n/a | 0.2 | ~~751,714~~ 676,540 | 0.043 | 0.50 | ~~16,162~~ 14,546 | ~~17~~ 15 | ~~1,132~~ 869 | S |
| Pacific white-sided dolphin | Cent. N. Pacific | 26,880 | | | | | 26,880 | 0.02 | 0.50 | n/a | 4 | 0 | ~~N~~S |
| Ribbon seal | Alaska | n/a | | | | | n/a | 0.06 | 0.50 | n/a | 1 | 193 | NS |
| Ringed seal | Alaska | n/a | | | | | n/a | 0.06 | 0.50 | n/a | 0.71 | 9,567 | NS |
| Sperm whale | N. Pacific | n/a | | | | | n/a | 0.02 | 0.10 | n/a | 0.45 | 0 | S |
| Spotted seal | Alaska | n/a | | | | | n/a | 0.06 | 0.50 | n/a | ~~3~~2 | 5,265 | NS |
| Stejneger's beaked whale | Alaska | n/a | | | | | n/a | 0.02 | 0.50 | n/a | 0 | 0 | NS |
| Steller sea lion | E. U. S. | ~~31,028~~ 44,996 | | | | | ~~31,028~~ 43,728 | 0.06 | 0.75 | ~~1,396~~ 1,967 | ~~2.9**~~ 5.12 | ~~2~~ 4 | S |
| Steller sea lion | W.U. S. | ~~34,775~~ 38,513 | | | | | ~~34,775~~ 38,513 | 0.06 | 0.10 | ~~209~~ 231 | ~~25.9~~ 30.7 | 176 188 | S |

C.F. = correction factor; CV C.F. = CV of correction factor; Comb. CV = combined CV; Status: S=Strategic, NS=Not Strategic, n/a = not available.

* = No or minimal reported take by fishery observers; however, observer coverage was minimal or nonexistent.

** = this does not include intentional take in British Columbia

[+] = There are two correction factors involved in the estimation of harbor porpoise abundance. One factor is 2.96 (CV = 0.18), which corrects for availability bias, is used for all three estimates for Alaska harbor porpoise stocks, and is from Laake et al. (1997). The correction factor included in this table corrects for animals missed on the trackline. Because this number differed for different stocks, this factor is included in the summary table.

see txt = see text for details.

## Citations


Laake, J. L., J. Calambokidis, S. D. Osmek, and D. J. Rugh. 1997. Probability of detecting harbor porpoise from aerial surveys: Estimating g(0). J. Wildlife Manage. 61(1):63-75.

**Appendix 3.**--Summary table for Alaska **Category 2** commercial fisheries. Source: 67 FR 2410; January 17, 2002. Notice of continuing effect of list of fisheries. [Note: This table will be updated when the numbers of participants in each fishery is updated in the 20045 List of Fisheries.]

| **Fishery (area and gear type)** | **Target species** | **Permits issued or fished (~~2000~~2003)** | **Soak time** | **Landings per day** | **Sets per day** | **Season duration** | **Fishery trends (1990-1997)** |
|---|---|---|---|---|---|---|---|
| Southeast AK drift gillnet | salmon | ~~481~~478 | 20 min - 3 hrs; day / night | 1 | 6 - 20 | June 18 to early Oct | # vessels stable but may vary with price of salmon; catch - high |
| Southeast AK purse seine | salmon | ~~416~~420 | 20 min-45 min; mostly daylight fishing, except at peak | 1 | 6 - 20 | end of June to early Sept | # vessel stable but may vary some with price of salmon; catch - high |
| Yakutat set gillnet | salmon | ~~170~~173 | continuous soak during opener; day / night | 1 | net picked every 2 - 4hrs/day or continuous during peak | June 4 to mid - Oct | # sites fished stable; catch - variable |
| Prince William Sound drift gillnet | salmon | ~~541~~540 | 15 min - 3 hrs; day / night | 1 or 2 | 10 - 14 | mid - May to end of Sept | # vessels stable; catch - stable |
| Cook Inlet drift gillnet | salmon | ~~576~~574 | 15 min - 3 hrs or continuous; day only | 1 | 6 - 18 | June 25 to end of Aug | # vessels stable; catch - variable |
| Cook Inlet set gillnet | salmon | ~~745~~746 | continuous soak during opener, but net dry with low tide; upper CI -day / night lower CI -day only except during fishery extensions | 1 | upper CI - picked on slack tide lower CI - picked every 2 - 6 hrs/day | June 2 to mid - Sept | # sites fished stable; catch - up for sockeye and kings, down for pinks |
| Kodiak set gillnet | salmon | 188 | continuous during opener; day only | 1 or 2 | picked 2 or more times | June 9 to end of Sept | # sites fished stable; catch - variable |
| AK Peninsula/ Aleutians drift gillnet | salmon | ~~164~~160 | 2 -5 hrs; day / night | 1 | 3 - 8 | mid - June to mid - Sept | # vessels stable; catch up |
| AK Peninsula/ Aleutians set gillnet | salmon | ~~116~~115 | continuous during opener; day / night | 1 | every 2 hrs | June 18 to mid Aug | # sites fished stable; catch - up since 90; down in 96 |
| Bristol Bay drift gillnet | salmon | ~~1903~~1879 | continuous soaking of part of net while other parts picked; day / night | 2 | continuous | June 17 to end of Aug or mid - Sept | # vessels stable; catch - variable |
| Bristol Bay set gillnet | salmon | ~~1014~~1041 | continuous during opener, but net dry during low tide; day / night | 1 | 2 or continuous | June 17 to end of Aug or mid - Sept | # sites fished stable; catch - variable |
| AK pair trawl | misc finfish | ~~2~~1 | | | | | new fishery |

**Appendix 4.**--Interaction table for Alaska **Category 2** commercial fisheries. Source: 67 FR 2410; January 17, 2002 and Perez (in prep). Notice of continuing effect of list of fisheries. [Note: This ~~table~~Appendix and Appendix 4 will be updated when the final List of Fisheries for 2005 is published.]

| **Fishery (area and gear type)** | **# of permits issued or fished (2003)** | **Observer program** | **Species recorded as taken incidentally in this fishery (records dating back to 1988)** | **Data type** |
|---|---|---|---|---|
| Southeast AK drift gillnet | 478 | never observed | Steller sea lion, harbor seal, harbor porpoise, Dall's porpoise, Pacific white-sided dolphin, humpback whale (self) | logbook and self reports |
| Southeast AK purse seine | 420 | never observed | humpback whale | self reports and stranding |
| Yakutat set gillnet | 173 | never observed | harbor seal, gray whale (stranding) | logbook and stranding |
| Prince William Sound drift gillnet | 540 | 1990<br>1991 | Steller sea lion (obs), northern fur seal, harbor seal (obs), harbor porpoise (obs), Dall's porpoise, Pacific white-sided dolphin, sea otter | observer and logbook |
| Cook Inlet drift gillnet | 574 | 1999 | Steller sea lion, harbor seal, harbor porpoise, Dall's porpoise, Cook Inlet beluga<br>Note: observer program in 1999 and 2000 recorded one incidental mortality/serious injury of a harbor porpoise | observer and logbook |
| Cook Inlet set gillnet | 746 | 1999 | harbor seal, harbor porpoise, Dall's porpoise, Cook Inlet beluga<br>Note: observer program in 1999 and 2000 recorded one incidental mortality/serious injury of a harbor porpoise | observer and logbook |
| Kodiak set gillnet | 188 | 2002 | harbor seal, harbor porpoise, sea otter; preliminary results not yet available for 2002 observer program | logbook |
| Alaska Peninsula/Aleutians drift gillnet | 160 | 1990 | northern fur seal, harbor seal, harbor porpoise, Dall's porpoise (obs) | observer and logbook |
| Alaska Peninsula/Aleutians set gillnet | 115 | never observed | Steller sea lion, harbor porpoise | logbook |
| Bristol Bay drift gillnet | 1879 | never observed | Steller sea lion, northern fur seal, harbor seal, spotted seal, Pacific white-sided dolphin, beluga whale, gray whale | logbook |
| Bristol Bay set gillnet | 1041 | never observed | northern fur seal, harbor seal, spotted seal, beluga whale, gray whale | logbook |
| Metkatla/Annette Island drift gillnet | Ask tribal fishery | never observed | none documented | none |
| AK pair trawl | 1 | never observed | none documented | none |

Note: Only species with positive records of being taken incidentally in a fishery since 1988 (the first year of the MMPA interim exemption program) have been included in this table. A species' absence from this table does not necessarily mean it is not taken in a particular fishery. Rather, in most fisheries, only logbook or stranding data are available which resulted in many reports of unidentified or misidentified marine mammals.

**Appendix 5.**--Interaction table for Alaska **Category 3** commercial fisheries. Note: Only species with positive records of being taken incidentally in a fishery since 1990 (the first year of the MMPA interim exemption logbook program) have been included in this table. A species' absence from this table does not necessarily mean it is not taken in a particular fishery. Rather, in most fisheries, only logbook or stranding data are available which resulted in many reports of unidentified or misidentified marine mammals. Source: 67 FR 2410; January 17, 2002. Notice of continuing effect of list of fisheries. [Note: This ~~table~~Appendix and Appendix 4 will be updated when the final List of Fisheries for 2005 is published. ~~numbers of participants in each fishery is updated in the 2004 List of Fisheries.~~]

| **Fishery name** | **# of permits issued or fished ~~1999~~2003** | **Observer program** | **Species recorded as taken incidentally in this fishery (records dating back to 1990)** | **Data type** |
|---|---|---|---|---|
| Prince William Sound salmon set gillnet | 30 | 1990 | Steller sea lion, harbor seal | logbook |
| Kuskokwim, Yukon, Norton Sound, Kotzebue salmon gillnet | ~~1922~~2055 | never observed | harbor porpoise | none |
| AK roe herring and food/bait herring gillnet | ~~2034~~1383 | never observed | none documented | none |
| AK miscellaneous finfish set gillnet | 3 | never observed | Steller sea lion | logbook |
| AK salmon purse seine (except for Southeast AK) | ~~953~~956 | never observed | harbor seal | logbook |
| AK salmon beach seine | ~~34~~36 | never observed | none documented | none |
| AK roe herring and food/bait herring purse seine | ~~624~~451 | never observed | none documented | none |
| AK roe herring and food/bait herring beach seine | ~~8~~6 | never observed | none documented | none |
| Metlakatla purse seine and drift gillnet (tribal) | 10 (seine)<br>60 (drift) | never observed | none documented | none |
| AK octopus/squid purse seine | 2 | never observed | none documented | none |
| AK miscellaneous finfish purse seine | ~~3~~1 | never observed | none documented | none |
| AK miscellaneous finfish beach seine | 1 | never observed | none documented | none |
| AK salmon troll (includes hand and power troll) | ~~2335~~3135 | never observed | Steller sea lion | logbook |
| AK north Pacific halibut/bottom fish troll | ~~330~~175 | never observed | none documented | none |
| AK state waters groundfish longline /set line (incl. sablefish/ rockfish/misc. finfish) | ~~731~~1613 | never observed | none documented | none |
| ~~Gulf of AK groundfish longline/set line (incl. misc. finfish/sablefish)~~ | ~~876~~ | ~~1989-present~~ | ~~Steller sea lion, harbor seal, northern elephant seal, Dall's porpoise~~ | ~~observer~~ |
| AK Gulf of Alaska halibut longline | 1,302 | | none documented | |
| AK Gulf of Alaska rockfish longline | 440 | | none documented | |
| AK Gulf of Alaska rockfish longline | 421 | | none documented | |
| AK Gulf of Alaska sablefish longline | 412 | | Steller sea lion, possible sperm whale | |
| ~~BSAI groundfish longline/set line (incl. misc. finfish/sablefish)~~ | ~~115~~ | ~~1989-present~~ | ~~Steller sea lion (SR), killer whale (obs), Pacific white sided dolphin (obs), Dall's porpoise (obs), northern elephant seal (log)~~ | ~~observer, logbook, and self reports (SR)~~ |
| AK Bering Sea, Aleutian Islands Greenland turbot longline | 36 | | Killer whale (Eastern North Pacific resident), Killer whale (Eastern North Pacific transient) | |
| AK Bering Sea, Aleutian islands cod longline | 114 | | Killer whale, ribbon seal, Steller sea lion, Dall's porpoise | |
| AK Bering Sea, Aleutian islands rockfish longline | 17 | | none documented | |
| AK Bering Sea, Aleutian Islands sablefish longline | 63 | | none documented | |
| AK halibut longline/set line (state and federal waters) | ~~3079~~2859 | never observed | Steller sea lion | self reports |
| AK octopus/squid longline | ~~7~~4 | never observed | none documented | none |

| Fishery name | # of permits issued or fished ~~1999~~2003 | Observer program | Species recorded as taken incidentally in this fishery (records dating back to 1990) | Data type |
|---|---|---|---|---|
| AK shrimp otter and beam trawl (statewide and Cook Inlet) | ~~58~~44 | never observed | none documented | none |
| ~~Gulf of Alaska groundfish trawl~~ | ~~198~~ | ~~1989 to present~~ | ~~Steller sea lion, harbor seal, northern elephant seal, Dall's porpoise~~ | ~~observer~~ |
| AK Gulf of Alaska flatfish trawl | 52 | | none documented | |
| AK Gulf of Alaska Pacific cod trawl | 101 | | Steller sea lion | |
| AK Gulf of Alaska pollock trawl | 83 | | Steller sea lion, fin whale, northern elephant seal, Dall's porpoise | |
| AK Gulf of Alaska rockfish trawl | 45 | | none documented | |
| ~~Bering Sea and Aleutian Island groundfish trawl~~ | ~~166~~ | ~~1989 to present~~ | ~~Steller sea lion, northern fur seal, harbor seal, spotted seal, bearded seal, ribbon seal, ringed seal, northern elephant seal, Dall's porpoise, harbor porpoise, Pacific white-sided dolphin, killer whale, walrus, sea otter~~ | ~~observer~~ |
| AK Bering Sea, Aleutian Islands Atka mackerel trawl | 8 | | Steller sea lion (Western U.S.) | |
| AK Bering Sea, Aleutian islands flatfish trawl | 26 | | Steller sea lion (Western U.S. ), Killer whale (Eastern North Pacific resident), Killer whale (Eastern North Pacific transient), northern fur seal, walrus, harbor seal, harbor porpoise, bearded seal | |
| AK Bering Sea, Aleutian Islands Pacific cod trawl | 87 | | Harbor seal, Steller sea lion | |
| AK Bering Sea, Aleutian Islands Pollock trawl | 120 | | Steller sea lion (western U.S.), Killer whale (Eastern North Pacific resident), Killer whale (Eastern North Pacific transient), Humpback whale (Central North Pacific), Humpback whale (Western North Pacific), minke whale, ribbon seal, harbor seal, Dall's porpoise, ringed seal, bearded seal, northern fur seal | |
| AK Bering Sea, Aleutian Islands rockfish trawl | 9 | | none documented | |
| State waters of Kachemak Bay Cook Inlet, Prince William Sound, Southeast AK groundfish trawl | 2 | never observed | none documented | none |
| AK miscellaneous finfish otter or beam trawl | ~~6~~303 | never observed | none documented | none |
| AK food/bait herring trawl (Kodiak area only) | ~~3~~4 | never observed | none documented | none |
| ~~AK crustacean pot~~ | ~~1852~~ | ~~1988 to present~~ | ~~harbor porpoise, humpback whale~~ | ~~stranding~~ |
| AK Bering Sea and Gulf of Alaska finfish pot | ~~257~~308 | 1990 to present | harbor seal, sea otter | observer |
| AK Aleutian Islands sablefish pot | 8 | | none documented | |
| AK Bering Sea sablefish pot | 6 | | Humpback whale (Central North Pacific), Humpback whale (Western North Pacific) | |
| AK Bering Sea, Aleutian Islands Pacific cod pot | 76 | | possible harbor seal | |
| AK Bering Sea, Aleutian Islands crab pot | 329 | | none documented | |
| AK Gulf of Alaska crab pot | | | none documented | |
| AK gulf of Alaska Pacific cod pot | 154 | | harbor seal | |
| AK Southeast Alaska crab pot | | | none documented | |
| AK Southeast Alaska shrimp pot | | | none documented | |
| AK octopus/squid pot | ~~72~~34 | never observed | none documented | none |
| AK snail pot | ~~2~~1 | never observed | none documented | none |
| AK North Pacific halibut handline and mechanical jig | ~~93~~67 | never observed | none documented | none |
| AK other finfish handline and mechanical jig | ~~100~~485 | never observed | none documented | none |

| **Fishery name** | **# of permits issued or fished ~~1999~~2003** | **Observer program** | **Species recorded as taken incidentally in this fishery (records dating back to 1990)** | **Data type** |
|---|---|---|---|---|
| AK octopus/squid handline | 2 issued<br># fished n/a | never observed | none documented | none |
| AK Prince William Sound herring roe/food/bait pound net | ~~452~~449 | never observed | none documented | none |
| Southeast AK herring food/bait pound net | 3 | never observed | none documented | none |
| Coastwise scallop dredge | ~~12*~~5 | never observed | none documented | none |
| AK dungeness crab (hand pick/dive) | 3 | never observed | none documented | none |
| AK herring spawn-on-kelp (hand pick/dive) | ~~452~~289 | never observed | none documented | none |
| AK urchin and other fish/shellfish (hand pick/dive) | ~~471~~500 | never observed | none documented | none |
| AK commercial passenger fishing vessel | ~~1107~~2702 (may contain freshwater vessels, will be updated later) | never observed | none documented | none |
| AK octopus/squid “other” | 19 | never observed | none documented | none |

- The 106 permits reflected in the previous SAR included all permits for this fishery in AK/WA/OR/CA. The new number of permits reflects only those permits for fishing in AK waters.

**Appendix 6.**--Observer coverage in Alaska commercial fisheries 1990-01.

| Fishery name | Method for calculating observer coverage | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gulf of Alaska (GOA) groundfish trawl | | 55% | 38% | 41% | 37% | 33% | 44% | 37% | 33% | ~~36%~~ | ~~32%~~ | ~~32%~~ | ~~27%~~ | | |
| GOA flatfish trawl | % of observed biomass | | | | | | | | | 39.2% | 35.8% | 36.8% | 40.5% | 35.9% | 40.6% |
| GOA Pacific cod trawl | % of observed biomass | | | | | | | | | 20.6% | 16.4% | 13.5% | 20.3% | 23.2% | 27.0% |
| GOA pollock trawl | % of observed biomass | | | | | | | | | 37.5% | 31.7% | 27.5% | 17.6% | 26.0% | 31.4% |
| GOA rockfish trawl | % of observed biomass | | | | | | | | | 51.4% | 49.8% | 50.2% | 51.0% | 37.2% | 48.4% |
| GOA longline | | 21% | 15% | 13% | 13% | 8% | 18% | 16% | 15% | ~~16%~~ | ~~13%~~ | ~~14%~~ | ~~11%~~ | | |
| GOA Pacific cod longline | % of observed biomass | | | | | | | | | 3.8% | 5.7% | 6.1% | 4.9% | 11.4% | 12.6% |
| GOA Pacific halibut longline | % of observed biomass | | | | | | | | | 51.3% | 47.1% | 51.1% | 43.0% | 41.4% | 9.6% |
| GOA rockfish longline | % of observed biomass | | | | | | | | | 1.0% | 1.4% | 0.2% | 1.3% | 4.9% | 2.5% |
| GOA sablefish longline | % of observed biomass | | | | | | | | | 16.9% | 14.0% | 15.2% | 12.4% | 13.7% | 9.4% |
| GOA finfish pots | | 13% | 9% | 9% | 7% | 7% | 7% | 5% | 4% | ~~7%~~ | ~~6%~~ | ~~7%~~ | ~~5.5%~~ | | |
| BSAI Pacific cod pot | % of observed biomass | | | | | | | | | 14.6% | 16.2% | 8.5% | 14.7% | 12.1% | 12.4% |
| BS sablefish pot | % of observed biomass | | | | | | | | | 42.1% | 44.1% | 62.6% | 38.7% | 40.6% | 21.4% |
| AI sablefish pot | % of observed biomass | | | | | | | | | 100.0 % | 50.3% | 68.2% | 60.6% | 69.4% | 47.5% |
| GOA Pacific cod pot | % of observed biomass | | | | | | | | | 6.7 % | 5.7% | 7.0% | 5.8% | 7.0% | 4.0% |
| Bering Sea/Aleutian Islands (BSAI) groundfish trawl | | 74% | 53% | 63% | 66% | 64% | 67% | 66% | 64% | ~~67%~~ | ~~75%~~ | ~~71%~~ | ~~77%~~ | | |
| BSAI Atka mackerel trawl | % of observed biomass | | | | | | | | | 65.0% | 77.2% | 86.3% | 82.4% | 98.3% | 95.4% |
| BSAI flatfish trawl | % of observed biomass | | | | | | | | | 59.4% | 66.3% | 64.5% | 57.6% | 58.4% | 63.9% |
| BSAI Pacific cod trawl | % of observed biomass | | | | | | | | | 55.3% | 50.6% | 51.7% | 57.8% | 47.4% | 49.9% |
| BSAI pollock trawl | % of observed biomass | | | | | | | | | 66.9% | 75.2% | 76.2% | 79.0% | 80.0% | 82.2% |
| BSAI rockfish trawl | % of observed biomass | | | | | | | | | 85.4% | 85.6% | 85.1% | 65.3% | 79.9% | 82.6% |
| BSAI longline | | 80% | 54% | 35% | 30% | 27% | 28% | 29% | 33% | ~~36%~~ | ~~35%~~ | ~~39%~~ | ~~30%~~ | | |
| BSAI Greenland turbot longline | % of observed biomass | | | | | | | | | 31.6% | 30.8% | 52.8% | 33.5% | 37.3% | 40.9% |
| BSAI Pacific cod longline | % of observed biomass | | | | | | | | | 34.4% | 31.8% | 35.2% | 29.5% | 29.6% | 29.8% |
| BSAI Pacific halibut longline | % of observed biomass | | | | | | | | | 38.9% | 48.4% | 55.3% | 67.2% | 57.4% | 20.3% |
| BSAI rockfish longline | % of observed biomass | | | | | | | | | 41.5% | 21.4% | 53.0% | 26.9% | 36.0% | 74.9% |
| BSAI sablefish longline | % of observed biomass | | | | | | | | | 19.5% | 28.4% | 24.4% | 18.9% | 30.3% | 10.4% |
| BSAI finfish pots | % of observed biomass | 43% | 36% | 34% | 41% | 27% | 20% | 17% | 18% | 15% | 17% | 9% | 15% | 14% | 13% |
| Prince William Sound salmon drift gillnet | % of estimated sets observed | 4% | 5% | not obs. | not obs. | not obs. | not obs. | not obs. | not obs. | not obs. | not obs. | not obs. | not obs. | not obs. | not obs. |
| Prince William Sound salmon set gillnet | % of estimated sets observed | 3% | not obs. | not obs. | not obs. | not obs. | not obs. | not obs. | not obs. | not obs. | not obs. | not obs. | not obs. | not obs. | not obs. |
| Alaska Peninsula/Aleutian Islands salmon drift gillnet (South Unimak area only) | % of estimated sets observed | 4% | not obs. | not obs. | not obs. | not obs. | not obs. | not obs. | not obs. | not obs. | not obs. | not obs. | not obs. | not obs. | not obs. |

| Fishery name | Method for calculating observer coverage | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cook Inlet salmon ~~set and~~ drift gillnet | % of fishing days observed | not obs. | not obs. | not obs. | not obs. | not obs. | not obs. | not obs. | not obs. | not obs. | ~~no est.*~~ 1.8% | ~~no est.*~~ 3.7% | not obs. | not obs. | not obs. |
| Cook Inlet salmon set gillnet | % of fishing days observed | not obs. | not obs. | not obs. | not obs. | not obs. | not obs. | not obs. | not obs. | not obs. | 7.3% | 8.3% | not obs. | not obs. | not obs. |

Note: Observer coverages in the groundfish fisheries (trawl, longline, and pots) were determined by the percentage of tons caught which were observed. Observer coverage in the groundfish fisheries is assigned according to vessel length; where vessels greater then 125' have 100% coverage, vessels 60-125' have 30% coverage, and vessels less than 60' are not observed. Observer coverage in the groundfish fisheries varies by statistical area; the pooled percent coverage for all areas is provided here. Observer coverages in the drift gillnet fisheries were calculated as the percentage of the estimated sets that were observed. Observer coverages in the set gillnet fishery was calculated as the percentage of estimated setnet hours (determined by number of permit holders and the available fishing time) that were observed.

~~* The Cook Inlet salmon set and drift gillnet fisheries were observed in 1999 and 2000. Precise estimates of observer coverage for these fisheries are not yet available.~~

**Appendix 7.**--Self-reported fisheries information.

The Marine Mammal Exemption Program (MMEP) was initiated in mid-1989 as a result of the 1988 amendments to the Marine Mammal Protection Act (MMPA). The MMEP required fishers involved in Category I and II fisheries to register with NMFS and to complete annual logbooks detailing each day's fishing activity, including: date fished, hours fished, area fished, marine mammal species involved, injured and killed due to gear interactions, and marine mammal species harassed, injured and killed due to deterrence from gear or catch. If the marine mammal was deterred, the method of deterrence was required, as well as indication of its effectiveness. Fishers were also required to report whether there were any losses of catch or gear due to marine mammals. These logbooks were submitted to NMFS on an annual basis, as a prerequisite to renewing their registration. Fishers participating in Category III fisheries were not required to submit complete logbooks, but only to report mortalities of marine mammals incidental to fishing operations. Logbook data are available for part of 1989 and for the period covering 1990-1993. Logbook data received during the period covering part of 1994 and all of 1995 was not entered into the MMEP logbook database in order for NMFS personnel to focus their efforts on implementing the 1994 amendments to the MMPA. Thus, aside from a few scattered reports from the Alaska Region, self-reported fisheries information is not available for 1994 and 1995.

In 1994, the MMPA was amended again to implement a long-term regime for managing mammal interactions with commercial fisheries (the Marine Mammal Authorization Program, or MMAP). Logbooks are no longer required. Instead, vessel owners/operators in any commercial fishery (Category I, II, or III) are required to submit one-page pre-printed reports for all interactions resulting in an injury or mortality to a marine mammal. The report must include the owner/operator's name and address, vessel name and ID, where and when the interaction occurred, the fishery, species involved, and type of injury (if animal was released alive). These postage-paid report forms are mailed to all Category I and II fishery participants that have registered with NMFS, and must be completed and returned to NMFS within 48 hours of returning to port for trips in which a marine mammal injury or mortality occurred. This reporting requirement was implemented in April 1996. During 1996, only 5 mortality/injury reports were received by fishers participating in all of Alaska's commercial fisheries. This level of reporting was a drastic drop in the number of reports compared to the numbers of interactions reported in the annual logbooks. As a result, the Alaska Scientific Review Group (SRG) considers the MMAP reports unreliable and has recommended that NMFS not utilize the reports to estimate marine mammal mortality (see June 1998 Alaska SRG meeting minutes; DeMaster 1998).

Self-reported fisheries information, where available, have been incorporated in the stock assessment reports contained in this document. Refer to the individual stock assessment reports for summaries of self-reported fisheries information on a stock-specific basis.

## CITATIONS

DeMaster, D. P. 1998. Minutes from sixth meeting of the Alaska Scientific Review Group, 21-23 October 1997, Seattle, Washington. 40 pp. (available upon request - Alaska Fisheries Science Center, 7600 Sand Point Way, NE, Seattle, WA 98115).